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Grazing kale *in situ* with the electric fence

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The commonest method, but not necessarily the most efficient. See article on pp. 468–71.

Avoncroft Cattle Breeding Centre

J. A. Moss, M.R.C.V.S.
Veterinary Director

In its first sixteen years, the Avoncroft Cattle Breeding Centre at Bromsgrove successfully pioneered methods of controlling vibrio fetus in a bull stud, and was one of the first centres to rest young bulls after limited use.

THE idea of starting an artificial insemination service in Worcestershire came from a meeting at Worcester at which Dr. Arthur Walton gave an address on the subject, and outlined the progress that had been made at Cambridge and Reading.

George Gregg, Secretary of the Cadbury family Trust owning Avoncroft College, heard Dr. Walton, with the result that on 9th September 1943, at a meeting to which three well-known local farmers had been invited, it was agreed to form a company under the chairmanship of Mr. George Cadbury. The company was incorporated on 12th April 1944 as the "Mid-Worcestershire Artificial Insemination Centre". Sixteen years later only two of the original directors remain. They are Mr. T. S. Bennett, the present chairman, and Mr. A. B. Quinney, treasurer.

Capital for the establishment of the centre was provided by the College trustees, and grants towards running costs were made by the Worcestershire County Council, Messrs. Cadbury Bros. and the original promoters. Operations began in November 1944 with two Shorthorn bulls and one Ayrshire, but the scheme got off to a poor start. An attempt had been made to manage with part-time staff, but results were poor and the members became dissatisfied. However, with the appointment of full-time staff and help and advice from Professor Dalling, the conception rate improved and confidence was gradually restored.

At the end of 1945 there were 110 members, and 622 cows had been inseminated. By the end of 1946 the numbers had more than doubled, and the centre had reached a critical point in its history. To qualify for subsidy under the Artificial Insemination (Moneys) Act it would be necessary to change the constitution. The choice was between handing over the centre to the Milk Marketing Board, or becoming a co-operative society registered under the Industrial and Provident Societies Acts. The latter course was chosen and the organization retained its independence.

Avoncroft is today one of the six independent centres in England and Wales. There are also 23 Milk Marketing Board centres and one owned by the Ministry of Agriculture.

Growth of the centre

The main centre is at Sugarbrook, on the outskirts of Bromsgrove. It has up-to-date buildings with accommodation for 38 bulls, all in separate loose boxes. In addition there is a farm attached, with buildings which will house up to 20 bulls, and altogether there are 50 acres of grazing. The bulls are

tethered out day and night for as long as the weather will permit (usually from March till October). To avoid moving bulls too far from the buildings, grass is cut and carried to them when they have grazed the pastures adjacent to the buildings. Grass in excess of immediate requirements is stored as silage or hay. Concentrates with a variety of protein and containing some animal protein are fed throughout the year.

There are at present 31 bulls of seven breeds, as shown: 12 Friesian, 6 Hereford, 4 Ayrshire, 3 Shorthorn, 2 Jersey, 2 Guernsey and 2 Aberdeen-Angus.

Membership stands at 6,750 and, during the year ended 30th September 1960, 56,904 first inseminations were recorded. These were divided between breeds as follows:

	No. of first inseminations	*per cent*
Hereford	22,781	40·0
Friesian	21,553	37·9
Aberdeen-Angus	3,320	5·9
Ayrshire	2,720	4·8
Shorthorn	2,435	4·3
Jersey	2,267	4·0
Guernsey	1,611	2·8
Others	217	0·3

The membership is spread over an area of approximately 1,800 square miles, which comprises Worcestershire, most of Herefordshire, about two-thirds of Warwickshire and parts of Shropshire and Gloucestershire. There are sub-centres at Hereford, Bromyard, Leamington Spa and Pershore at present; but reorganization is taking place. By the spring of 1961 there will be only three sub-centres, and no inseminators will operate from Bromsgrove. There are 23 inseminators, 13 of whom will be based on a new sub-centre at Alcester.

Modern techniques and equipment

It has always been the policy at Bromsgrove to be up to date in technique. Visitors are impressed by the modern laboratory suite which was designed for the most hygienic handling of semen that is practicable. Fresh skimmed milk and egg yolk containing penicillin and streptomycin are used for dilution of the main issue of semen. Deep freezing has been employed since 1952, using yolk/citrate as the diluent.

The Society was one of the pioneers of methods to control vibrio fetus infection in a bull stud. An extensive test-mating programme involving the purchase of a group of 25 heifers was carried out in 1956–57 to establish a team of bulls free from the infection. Routine test-mating has been applied since, to maintain freedom from the disease.

All bulls at the Centre are blood-typed by the Copenhagen blood typing laboratory. This makes it possible to carry out parentage checks whenever required.

The Directors have always been conscious of their responsibility to the members to provide a service with the best bulls that can be found. In 1947 they decided to advertise for proven sires. As a result several old proven

bulls were purchased, but with disastrous effect upon conception rates. Now that we can test for vibrio fetus infection, and with the use of antibiotics in semen, it is again possible to introduce bulls proven in natural service. This is being done in certain cases, but it is recognized that the lactation figures of a bull's daughters in a single herd can be misleading and that the most reliable proof of a bull's genetic merit is on a large number of daughters spread over a large variety of herds. It has already been shown in America that bulls which appeared to be breeding above-average daughters in natural mating were actually below average when measured on a large group of A.I. progeny.

It is generally accepted that it is wrong to use unproven bulls extensively, and Avoncroft was one of the first centres to adopt the principle of resting young bulls after limited use. As the bull proving programme develops, the number of bulls owned by the Society will go on increasing, and this is why a farm was acquired. The buildings are to be used for housing bulls which are removed from service whilst waiting for their daughters to grow up. On the basis of their daughters' yields and conformation the sires will then either be slaughtered or brought back into the stud as proven sires.

How bulls are chosen

Selection of bulls for the centre is based on many criteria. Because contemporary comparison figures are used in assessing the merit of bulls for A.I., pedigree breeders have often called A.I. cattle breeders "paper breeders". What these critics have failed to recognize is that the statistics are only used in conjunction with the traditional methods of selection. It would only need a few trips with the bull selection panels from the Bromsgrove centre to demonstrate that conformation of animals, particularly the udders and legs of dairy cattle, and other qualities such as temperament and longevity come before milk figures. It is a good thing, though, that the contemporary comparison system is available to help the selectors to judge the true genetic meaning of daughter averages.

Young dairy bulls bought for proving at Avoncroft must be by sires which are proven good for milk, butterfat and dairy qualities, and out of cows with above-average production over several lactations. It is preferable for the dams themselves to be by proven sires. An attempt is also made to follow lines of breeding, so that standardization of type can be expected. In the Ayrshire breed this policy has been developed with good results, and there are now at the centre two proven bulls, one nearly proven and one whose daughters are awaited, all on the same line of breeding.

Planned mating has been used on only one occasion, and it is not the policy of the centre to use it extensively. The one occasion was when the famous bull Elmwood Ever Ready was mated back to several cows in the Elmwood herd. As a result there is a son at the centre now whose daughters' lactation results are eagerly awaited. Pedigree breeders are beginning to realize that sons of proven sires are the best sellers, and they will certainly make more and more use of nominated A.I. services to their best cows for bull breeding purposes. This will be a good thing for livestock improvement. There will be no need for planned matings by the A.I. authorities; the job will be in the hands of the breeders, who know their cow families.

Progeny testing and the use of proven sires

A problem has arisen concerning the progeny testing scheme and use of proven sires. More and more farmers are making use of the nominated service with proven sires, and members who do this are mainly those who record under the National Milk Records Scheme. By breeding more of their cows to proven bulls they are making it increasingly difficult for the Centre to get sufficient use of the young bulls to prove them in reasonable time. It may be necessary to introduce some form of inducement to members to make more use of the young bulls. This could be done either by reducing the cost of inseminations with young proving bulls in N.M.R. herds, or by rewarding members for completed lactation figures.

Getting on for half the inseminations from Avoncroft are with beef bulls, mainly Hereford. This is not surprising since the area of operations includes Herefordshire, and the well-known markets for white-faced calves and stores at Hereford, Leominster, Worcester, and Kidderminster are supplied from members' farms. There has been close co-operation with the Ministry of Agriculture in its trials with sire performance and progeny testing of Hereford bulls. Two bulls performance tested at the experimental husbandry farm at Rosemaund are used at the centre each year, and calves by these out of Friesian cows are afterwards bought from their owners by the Ministry of Agriculture, to be themselves performance tested. The trial is being organized to test the belief held in America that growth and food conversion rates are highly transmissible.

Beef bulls for the centre have always been selected by traditional methods, and after use they have been judged on the conformation and selling value of their calves. Even if sire performance testing is proved to be a reliable way of forecasting growth rate and food conversion efficiency of offspring it will be necessary, in this part of the country, to select for traditional conformation for many years to come. The task at Bromsgrove will be to find show type bulls with good performance test results.

A.I. for pigs

Experiments with artificial insemination in pigs have been going on in a small way since 1956. Work is carried out in a limited number of herds in the region of the main centre. Results this year on 39 sows and gilts are 51 per cent farrowing to first inseminations, a considerable improvement over previous years. But the numbers are small and the demand for pig A.I. in the west Midlands does not appear to be great. The service with boar semen is at present subsidized by P.I.D.A., but the directors of Avoncroft Cattle Breeders are doubtful whether pig A.I. will become an economic possibility. Taking into consideration the small number of sows that might be inseminated from one boar, the time required to carry out the insemination and wasted visits to sows which are not ready for insemination, it is certainly not economic at present, and there will need to be marked improvements in technique before it is. In any event the cattle insemination activities will not be allowed to subsidize a pig service.

As in other centres, facilities are available at Bromsgrove for semen storage by private breeders. Semen is collected on the breeder's farm and

frozen and stored in a special laboratory set up for the purpose at the main centre. There is an increase in the sale of semen by breeders, and the work of handling semen which has been licensed for use in other herds will add to the use already made of the special services provided. At the present time the semen of over 20 bulls is stored for private owners.

Some breed societies are now trying to formulate schemes for the use of proven sires belonging to their members, and also to make use of A.I. services for proving bulls in private ownership. Any such proposal would need to be considered carefully by the centre's management in relation to its effect on the centre's own bull proving programme. It will be in the interests of the livestock industry to develop fuller co-operation between the breed societies and the cattle breeding centres. It must, however, be a true partnership with a common ideal, not merely an arrangement to make use of the A.I. organization to bolster up the breed societies.

Turkey Rearing

W. A. MOTLEY

Over Wallop, near Stockbridge, Hants

Mr. Motley draws on over forty years' experience to write on some important aspects of turkey observation and management that deserve more publicity than they usually get.

THE Editor has asked me to write an article on my personal experiences in turkey rearing, and to do this, I must start with some background history.

I began poultry farming in 1916, and during the years up to 1940 bred considerable numbers of poultry for those days—up to 15,000. I did not start turkeys until 1928 and then, with six breeders, the numbers increased rapidly over the next few years. They were all grown on grass, but with mounting losses.

In 1934 over 5,000 were grown for the first time intensively for the Christmas market, with encouraging results. We then tried breeding intensively the following year, but without results, and not until 1943 did we meet with much success in this sphere. From then on this was the system for both breeding and rearing. Our success here was probably due to the large quantities of green food fed to birds of all ages, since we did not then understand the requirements of turkeys.

The next few years were good, but the gradually mounting losses intensively were puzzling, for not only were we unable to account for them, but neither could the Ministry at Weybridge. Many reports came back with, in substance, the wording "no visible cause of death". We then started sending birds to Bristol University, who told us that in their opinion they were being poisoned, not intentionally, but by some unsuitable food. It was not until 1950—with the help of Mr. Barton Mann—that the trouble was shown to be an excess of animal proteins.

In 1952 Mr. Mann joined us as bacteriologist and dietician, and showed

us how to make use of the grass trigger factor and reduce animal protein. This meant a return to grass rearing and breeding, so while the portables were being made, considerable numbers of turkeys were kept in netted compounds on grass; this was not entirely satisfactory, but served as a temporary measure during the transition period. Today we have some 2,500 portables on four farms, in addition to about 6,000 feet run of pole houses for killing birds, 200,000 incubator capacity and 70,000 brooding capacity.

This, then, forms the background to our present practice of turkey rearing.

Brooding

We find it absolutely essential to have the poults moved from the incubators into the brooders, fed and watered in the least possible time. Every hour counts and special, urgent measures should be adopted with poults which have long journeys before getting into the brooders. The brooders must be really hot to hasten warming up the poults, although there is no need for excess heat once they are started.

Do not be misled into feeding highly scientifically balanced food for starting in preference to a palatable one which the poults will take quickly. They like the smell of fish solubles, and a mash containing 1 per cent, dampened to a crumbly state with milk, is enjoyed and quickly eaten. Remember that the intestinal tract of a day-old poult is very frail and cannot deal immediately with the minerals and vitamins in the way they are usually presented; there is time enough after 24 or 36 hours to feed these fast growing foods.

Neither do poults take readily to crumbs to start with, despite their being the fastest growing food form obtainable; but if nothing else is available, then damp the crumbs with milk for the first 24 hours or so to get a quick start. Crumbs or dry mash are all right after the poults are started.

Most growers completely underestimate the invaluable asset of a quick start in helping to produce an evenly grown flock with a low mortality.

The small outdoor oil-burning brooders with which we started in 1928 are still used. With only about 70 birds in a house, which has a hinged roof for sun, and sliding windows, the bacterial build-up is so small they can be used indefinitely throughout a long season with only a ten-day break between each lot of birds. With an extra lamp on the wire floor they are reasonably good in very cold weather. The labour charge is rather high, but the capital cost is low, and we feel that the direct light and abundance of fresh air are considerable assets—so until we can find something better, we shall continue with this type. The birds are brooded for $3\frac{1}{2}$ weeks in these boxes, and then transferred to others with verandahs attached until they are two months old. We still prefer all-wire floors up to this age. The verandahs have batten sides which, while reducing the wind, keep the birds in moving fresh air without a bacterial build-up.

Rearing birds for killing

It is general practice in the industry to rear all market birds, and particularly those which are destined for killing around 17 weeks old, wholly

on the intensive system and, for either lack of ground or special equipment, I see no possible chance of a change—particularly with the new, fast growing foods which compounders are offering. Our experience over the years, however, proves that a good grass system well managed will produce the same or better growth and finish with less mortality, but with more labour and on a food containing less costly ingredients. Our repeated experiences show that grass has a trigger factor which has the effect of replacing a considerable portion of the animal protein and releases some unidentified growth factors in the rest of the ration.

The principles in management—and this is very important—are therefore as follows:

1. If birds on grass are fed intensive food their mortality will be considerable.
2. If these same birds with the same food are changed to an intensive system there will be a great reduction in mortality.
3. If the same birds are again transferred to grass, but with a very low animal protein diet, their mortality will be the lowest of all.

I do not know of any really good fattening rations unless they contain fat and, although quite good for show purposes, commercially this is a doubtful proposition.

Rearing breeding birds

Quite apart from the science of genetics and the laborious management of testing matings, the rearing of birds to replace the breeding stock calls for special considerations. If one is to have high and continuous egg production, then the growing must be arranged for these birds not to lay too soon, for the younger they start laying as a flock, the sooner they stop. Also, if hatchability and brooding are to be good, then the necessary vitality and vitamin reserves must be developed in the potential breeders.

First, take production. Controlled lighting will be necessary if out-of-season production is needed, and secondly, relatively high vitamin reserves and vitality will develop if the birds are reared on grass and on as low an animal protein diet as possible from 8 weeks old onwards. A fair amount of animal protein will be advisable to start with at 8 weeks, but this is gradually reduced.

The most practical guide is the state of their feathers, which are nearly all protein. A drastic shortage of animal protein could start feather plucking, in which case the odd bird in superb feather is likely to be the culprit; any birds that show abnormally small growth and whose genetical make-up may need more animal protein can quite well be done without.

The odd dead bird should be opened up, and if several show a slightly inflamed gut, something in the food line is not agreeing with them—so check up the animal protein and reduce it if practicable.

Provided breeding and rearing are successful it is our experience that a very observant watch should be practised during the production season. A spell of very dark weather, combined with not letting the birds out early because of the bad weather, can cause a fall in production and fertility that it is usually impracticable to regain; this generally applies to midwinter and midsummer. Producing poults for December and onwards is a very tricky

business, and an exceptionally well-planned lighting programme is vital, otherwise a complete failure may occur in the spring.

Thin-shelled eggs can cause considerable concern in breakages. The shell should be measured with an engineer's micrometer, and anything below 10 thou. needs adjustment. Ten days on oats will usually bring them back to 14 or 16 thou.—it is the animal protein problem all over again.

Mottled hatching eggs give better results than plain coloured eggs. This may be genetical, lack or loss of vitamin reserves or, again, animal protein excess, a fact we have not thoroughly checked up.

In dealing with this very real problem of animal protein excess in all classes of turkeys, one must be alert to the difference between what is "provided" in the diet and what is "assimilated".

I do not think feather condition is used sufficiently as an aid to management in practice. If one is very observant a simple set of rules can be of great help. The colour of droppings is another factor of practical aid.

Lucerne as a Grazing Crop

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and
D. J. MINSON, B.SC., PH.D., A.R.I.C.
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A short account of what has been learned from experiments at Hurley about the yield, and feeding value of lucerne as a grazing crop at different stages of growth and under different systems of management, compared with an ordinary grazing ley.

LUCERNE is invaluable for grazing during dry summer weather, particularly on free draining soils, and produces large amounts of herbage for conservation when grazing is not required. The needs of lucerne as a crop are now quite widely appreciated in this country; but little experimental work has been carried out on its feeding value since the digestion trials of Woodman *et al.* in the 1930s.[1]

Experiments carried out at Hurley in 1953 and 1954[2] showed that cattle could be maintained for long periods on lucerne/grass swards without ill effects. From July to September 1953, gains of 1·2 lb per head daily were obtained with fattening cattle, and from mid-May to the end of September 1954 yearling steers gained 1·75 lb per head daily on lucerne/grass pastures. In both these trials there was little response to the feeding of carbohydrate-rich supplements (dried sugar beet pulp or ground barley). The response to 1 lb of either was less than 0·1 lb liveweight gain.

These experiments were followed by an experiment sown down in April 1954 to compare the following seeds mixtures:

1. Lucerne, du Puits, 20 lb per acre.
2. S.37 cocksfoot, 20 lb per acre, and S.100 white clover, 2 lb per acre.

from pastures containing lucerne. The utilized output of the cocksfoot/white clover sward was satisfactory for a grass/clover mixture, although it could probably have been increased by the use of nitrogenous fertilizer. Superphosphate and muriate of potash were applied at 3 cwt to the acre per year to all mixtures, but no nitrogenous fertilizer was used. Inclusion of cocksfoot appeared to increase utilized output of the broadcast mixture compared with the pure lucerne, and the output of the alternate drills might have been improved by the use of 9 inch instead of 1 foot drills.

Feeding value of lucerne

The inclusion of grass in lucerne swards also appeared to benefit the animal. Cattle grazing on lucerne alone for long periods did not appear thrifty, and this appearance was supported by the average seasonal liveweight gains of the four test animals:

	Lucerne	Cocksfoot/ white clover	Lucerne/ cocksfoot (broadcast)	Lucerne/ cocksfoot (drilled)
	Liveweight gains: lb per head per day			
1956	1·03	1·29	1·22	1·76
1957	1·33	1·46	1·41	1·54

One of the merits of the alternate drill system is indicated by the better performance of the cattle grazing on the drills.

Liveweight gain figures give a useful picture of seasonal output but not of changes which occur over short periods. For this purpose estimates of digestibility are much more reliable. Herbage at the same stage of growth as that being grazed by the cattle was cut from the plots and, after cold storage, it was fed to sheep under controlled conditions. The resulting digestibility estimates showed that small seasonal differences between mixtures did occur, cocksfoot in general being slightly more digestible than lucerne. The small differences obtained would not explain the higher animal gains on alternate drills. However, intake of herbage was also measured frequently during both seasons, and the results indicate that intake on the drills was slightly higher.

The results obtained on the digestibility of lucerne are interesting, and support Woodman's conclusion[1] that lucerne in the bud and early flower stage is comparable to a good coarse fodder. The digestibility of lucerne fell continuously from nearly 74 per cent on 1st May, when the lucerne was in the pre-bud stage, to below 58 per cent on 1st July, when the lucerne was in full flower. This was obviously due to ageing and lignification of the first growth. The digestibility of the second growth when the lucerne was again flowering was 60 per cent in 1956 and 57 per cent in 1957. The third growth gave digestibilities of 68 per cent in 1956 and 60 per cent in 1957. The third growth in September and October was leafier and the stems much shorter than in the second growth; some bloat occurred at this time in both years. Even under controlled conditions of strip grazing, the grazing animal can select a diet of higher quality than is indicated by the results of these determinations, and although it may be tempting to graze the lucerne at younger and more nutritious growth stages, it must be remembered that there is a much greater chance of bloat and also that the vigour of the plant will be reduced.

3. Lucerne, du Puits, 15 lb per acre, and S.37 cocksfoot, 3 lb per acre sown broadcast.
4. Lucerne, du Puits, 5 lb per acre, and S.37 cocksfoot, 3 lb per acre, in alternate drills 1 foot apart.

The object of the experiment was to follow the performance of cattle throughout the grazing season, and to study the feeding value of the crop at the time of grazing by estimating the digestibility of the herbage. Numerous measurements were taken on both animals and pastures, the results of which will be enumerated only where they have some practical implication.

Grazing method

The pastures were grazed throughout the season so that the period allowed for growth or re-growth was similar for all mixtures. A system of strip grazing was adopted. Electric fences were moved daily in front of the cattle, and back fences were brought up behind them at least once each week. By this management system the cattle were not allowed to remain on any one piece of ground for more than 7 days. Lucerne begins to shoot very quickly after defoliation, and grazing animals will bite at this young herbage as soon as it appears, to the detriment of the vigour of the plant. The intensity of grazing was such that about 70 per cent of the available herbage was utilized. The cattle were not forced to eat the woody lucerne stems, which were mown off as soon as the animals were moved forward. This cutting of rejected stalks is advisable, for if left they are liable to impede the grazing of re-growth. Each sward was defoliated three times in the season, grazing starting in early May and ending in October. The pastures were first grazed through May and June, and were rested for 6–8 weeks between the subsequent grazings. Cutting experiments have shown that more frequent defoliation at a younger stage of growth will weaken lucerne.[3]

In 1955 the plots were grazed down quickly by large groups of cattle during short periods, but as this method did not allow an accurate assessment of liveweight gain, it was altered in 1956 and 1957. In these years, groups of four yearling Hereford-cross bullocks were grazed in 2 paddocks of 1 acre, each group remaining on its particular sward type for approximately 170 days. In order to give each mixture a similar rest period before grazing, either the mowing machine or extra cattle were used to remove excess herbage.

Estimates of the amount of dry matter utilized from each pasture have been obtained by multiplying the number of cattle grazing days obtained from each mixture by the average intake of herbage dry matter. To these figures were added yields of herbage removed by cutting, allowing a wastage figure of 30 per cent, which would have occurred in grazing. The following figures were obtained:

	Lucerne	Cocksfoot/ white clover	Lucerne/ cocksfoot (broadcast)	Lucerne/ cocksfoot (drilled)
	100 lb per acre utilized dry matter			
1956	70·6	54·6	75·2	64·1
1957	69·0	42·3	70·2	66·5

The results clearly illustrate the high utilized output that may be obtained

Effect of grazing

Two cuts for silage were taken from the plots before ploughing in 1958. The quantity of herbage removed and its botanical composition are given below:

	Dry matter 100 lb per acre		Botanical composition: 29th May				
	29th May	*17th July*	*Lucerne*	*Cocks-foot*	*White clover*	*Weed grasses*	*Other species*
Lucerne	38·7	31·1	59·0			40·2	0·8
Cocksfoot/ white clover	27·3	12·2		48·8	10·6	37·3	3·3
Lucerne/ cocksfoot (broadcast)	43·9	36·8	46·4	14·0		37·9	1·7
Lucerne/ cocksfoot (drilled)	39·2	30·4	41·5	9·6		44·5	4·4

The figures indicate that, in spite of damage by *Verticillium* wilt and eelworm, the lucerne had stood up well to the grazing system imposed in the three previous years, and could still give high yields in the fourth harvest year. The inclusion of cocksfoot in broadcast lucerne had helped to check the ingress of weed grass (mainly *Poa* spp.), but this was not the case with alternate drills. The drill method was developed mainly for winter grazing[4] and it has been observed that where such pastures are grazed during the winter the ingress of weed grasses is checked.

Value of the alternate drill system

Lucerne grown on a field free-draining in winter would be a valuable addition to many more farms, particularly in the south and east of England. A sowing in alternate drills at approximately 9 inch spacings, using seed rates of 5 to 7 lb of lucerne and 3 to 5 lb of grass, is suggested. After the year of seeding such a sward will give two good cuts for conservation in May and July, or it can be used for summer grazing. The sward can then be shut up, dressed with 2 or 3 cwt of nitrogenous fertilizer, and grazed off in November and December. This system will add vigour to the lucerne sward by giving it long rest periods and allowing it to die back in the autumn; bloat, which can occur on the leafier third growth of lucerne in September and October, will be avoided; and an extended grazing season which will reduce costs will be obtained.

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One of the merits of the alternate drill system is indicated by the better performance of the cattle grazing on the drills.

Liveweight gain figures give a useful picture of seasonal output but not of changes which occur over short periods. For this purpose estimates of digestibility are much more reliable. Herbage at the same stage of growth as that being grazed by the cattle was cut from the plots and, after cold storage, it was fed to sheep under controlled conditions. The resulting digestibility estimates showed that small seasonal differences between mixtures did occur, cocksfoot in general being slightly more digestible than lucerne. The small differences obtained would not explain the higher animal gains on alternate drills. However, intake of herbage was also measured frequently during both seasons, and the results indicate that intake on the drills was slightly higher.

The results obtained on the digestibility of lucerne are interesting, and support Woodman's conclusion[1] that lucerne in the bud and early flower stage is comparable to a good coarse fodder. The digestibility of lucerne fell continuously from nearly 74 per cent on 1st May, when the lucerne was in the pre-bud stage, to below 58 per cent on 1st July, when the lucerne was in full flower. This was obviously due to ageing and lignification of the first growth. The digestibility of the second growth when the lucerne was again flowering was 60 per cent in 1956 and 57 per cent in 1957. The third growth gave digestibilities of 68 per cent in 1956 and 60 per cent in 1957. The third growth in September and October was leafier and the stems much shorter than in the second growth; some bloat occurred at this time in both years. Even under controlled conditions of strip grazing, the grazing animal can select a diet of higher quality than is indicated by the results of these determinations, and although it may be tempting to graze the lucerne at younger and more nutritious growth stages, it must be remembered that there is a much greater chance of bloat and also that the vigour of the plant will be reduced.

Effect of grazing

Two cuts for silage were taken from the plots before ploughing in 1958. The quantity of herbage removed and its botanical composition are given below:

	Dry matter 100 lb per acre		Botanical composition: 29th May				
	29th May	*17th July*	*Lucerne*	*Cocks-foot*	*White clover*	*Weed grasses*	*Other species*
Lucerne	38·7	31·1	59·0			40·2	0·8
Cocksfoot/ white clover	27·3	12·2		48·8	10·6	37·3	3·3
Lucerne/ cocksfoot (broadcast)	43·9	36·8	46·4	14·0		37·9	1·7
Lucerne/ cocksfoot (drilled)	39·2	30·4	41·5	9·6		44·5	4·4

The figures indicate that, in spite of damage by *Verticillium* wilt and eelworm, the lucerne had stood up well to the grazing system imposed in the three previous years, and could still give high yields in the fourth harvest year. The inclusion of cocksfoot in broadcast lucerne had helped to check the ingress of weed grass (mainly *Poa* spp.), but this was not the case with alternate drills. The drill method was developed mainly for winter grazing[4] and it has been observed that where such pastures are grazed during the winter the ingress of weed grasses is checked.

Value of the alternate drill system

Lucerne grown on a field free-draining in winter would be a valuable addition to many more farms, particularly in the south and east of England. A sowing in alternate drills at approximately 9 inch spacings, using seed rates of 5 to 7 lb of lucerne and 3 to 5 lb of grass, is suggested. After the year of seeding such a sward will give two good cuts for conservation in May and July, or it can be used for summer grazing. The sward can then be shut up, dressed with 2 or 3 cwt of nitrogenous fertilizer, and grazed off in November and December. This system will add vigour to the lucerne sward by giving it long rest periods and allowing it to die back in the autumn; bloat, which can occur on the leafier third growth of lucerne in September and October, will be avoided; and an extended grazing season which will reduce costs will be obtained.

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Red Spider Mite under Glass

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Mr. Graham discusses how red spider mite becomes established in glasshouses, the advantages and disadvantages of present controls, and some of the gaps in our knowledge of this pest.

MOST commercial growers would be quite adamant that the glasshouse red spider mite (*Tetranychus telarius* L.) is a highly undesirable intruder on their premises, capable of causing very great damage, and their policy, when its presence is discovered, is complete extermination as soon as possible.

Despite the puny size and fragile appearance of the mite, this ideal is seldom realized, even with the range of chemicals and the various methods of applying them available today, and the purpose of this article is to review briefly some of the reasons why the red spider mite continues to give trouble under glass. Let us first of all examine the creature in this environment.

It is somewhat misleading to talk of *the* glasshouse red spider mite, as two forms—the green and the reddish-brown—exist in this country, differing not only in colouration but also in their life cycles; the former usually hibernates and the latter does not. Cross breeding can take place, with the production of fertile hybrids which may be indistinguishable from the reddish-brown form.[1] These differences refer to mature females only, and the colour scheme is further complicated by the fact that the females of the green form turn brick-red when ready to hibernate.

This question of colour forms may seem irrelevant, but its importance will be shown when aspects of chemical control are discussed.

Certain biological advantages help the mites to become established residents in glasshouses. They can feed and breed on a wide range of plants grown under glass, and will colonize top and soft fruit and many garden plants and weeds. The undersides of leaves are usually preferred (carnations are an exception), and this has an obvious bearing on control measures; defence is afforded also by the dense webbing which the mites spin in the later stages of an infestation. The green form enjoys the further advantage of its hibernation, sometimes from September to March, when the females take refuge in cracks and crevices in the glasshouse structure and contents. It has proved impossible to eradicate them by any practical chemical means.

The persistence of red spider is related also to its rate of development which, in a high temperature environment such as a cucumber house, may be very fast, the transition from egg to adult taking less than one week. The females produced from these eggs, in their turn, lay up to 100 eggs.

Application of controls

Red spider was considered serious twenty-five or more years ago, and it seems that the widespread use of modern acaricides* cannot altogether be

* Acaricide: A chemical used to kill mites—now sometimes called a miticide.

blamed for its present pest status. Fumigation and high volume spraying were used then as they are now, but the number of materials was very limited—about four in all. Today a much greater choice both of materials and methods of application is available, but no one would claim that the red spider problem has been overcome, and an appraisal of the methods of applying chemicals to plants and of the chemicals themselves may show why not. The methods will be considered first of all.

If an acaricide is to be applied to the foliage of a plant, one would expect to get the best results from a complete coverage of the plant with the active material. This may not be strictly necessary, depending on the mode of action of the chemical, but in general it is what we are trying to achieve in all methods of application.

There are practical difficulties associated with high volume spraying in glasshouses, such as the manoeuvring of equipment in confined spaces and damage to plants; furthermore on some crops the drenching of the foliage with large amounts of water may be undesirable. The method is laborious and time-consuming, and even so, in a dense stand of plants often fails to give a complete cover.

It is understandable, therefore, that acaricidal and other smoke generators found such a ready market because of the ease and speed with which they could be put into operation. The idea of filling the air space of a glasshouse with a pest-controlling chemical which would permeate every part, and leave a deposit of the active ingredient on every plant surface, sounds foolproof, but early development work[2] showed that the distribution of particles on surfaces was anything but even, deposits being greatest on horizontal surfaces and least on inverted surfaces (those facing the ground). The undersides of leaves, for instance, are often inverted surfaces.

Because mites usually prefer the undersides of leaves, the implication of this finding on red spider control by purely contact materials is obvious, and the efficiency of smokes is often further reduced by leaky glasshouses which reduce their concentration, and by their use at temperatures below 70°F.

Aerosols and atomizers of various types are the alternatives to smokes in use at the present time, and should also be used in closed houses at 70°F. In aerosols the active material is contained in a highly volatile solvent held as a liquid under pressure in a canister, and on release of the pressure through a valve the solution escapes to the atmosphere. In atomizers the liquid is "atomized" by being carried through a small aperture by a stream of air from a compressor, as in the paint sprayer type of apparatus. Both devices produce droplets of very small size which are not directed at the plants but released into the air, usually in the vicinity of the pathway, the theory being that a high percentage of them, carried in all directions by small air currents, will eventually impinge on all plant surfaces.

Unfortunately what happens in practice is often rather different, and at least some of the reasons why chemical control measures fall short of expectations have been examined in recent studies by Staniland.[3, 4] His work depends on the fact that fluorescent dyes can be combined with certain spray materials, and that the distribution of hitherto invisible deposits on treated plants (or other surfaces) can readily be examined under ultra-violet light.

These dyes have become known as "fluorescent tracers", and their use has

shown that some standard methods of application can be surprisingly inefficient. For instance, the floor of the glasshouse has been known to receive more than its fair share of the particles from aerosols and atomizers, the number which arrived on the target often being disappointingly small—and many of these were filtered out or trapped in plant hairs and red spider webbing. Low volume spraying by air blast sprayers has also failed in some experiments to live up to its reputation.

A method which has not been evaluated by the tracer technique is the use of the thermal fogging machine: this is really a refinement of the smoke generator, but uses oil-based formulations metered into hot exhaust gases to produce an exceedingly dense fog which has momentum and can be aimed. Glasshouse tests in this country have been very promising, and although some capital outlay is involved, the machine is cheap to operate. It shares one disadvantage with low volume air blast sprayers—that of noise in confined spaces.

Choice of a suitable material

Materials for the control of red spider are available today in bewildering variety, but to be acceptable for commercial glasshouse use they must all fulfil certain conditions. They must kill or incapacitate a high percentage of one or more stages of the pest but not have this effect on the crop treated; be economical and easy to apply; and have persistence or lack persistence according to the time lapse between application and marketing the crop.

The last condition refers mainly to edible crops, on which residues of certain chemicals must not exceed safe limits for human consumption. The grower today must also cope with other restrictions on the handling and application of some of the substances in use because of their toxicity to human beings, and as a result close supervision of control measures by owner, manager or foreman is often essential.

Many of these toxic chemicals belong to the organophosphorous group, some of which have the valuable property of being systemic (they can be absorbed into the sap stream of the plant) and might be expected to solve all the difficulties arising from inefficient methods of application. The development of systemics has introduced a new method of applying acaricides. The "diluter" is particularly suited to the treatment of crops in beds or in pots standing on the glasshouse floor. Given a material of suitable specific gravity this device, filled with concentrate, will produce a solution of any required strength (within limits) when connected to the main water supply, and this can be applied by hose pipe or through irrigation harness, effectively combining control measures with routine watering.

Now we have reached a stage where we can get the acaricide inside the plant, and when the mites feed they cannot fail to be poisoned—or so one would think. Complete efficiency, however, is not always achieved even with systemics, for their absorption depends to some extent on the plant being in active growth, and on the growing medium itself, and when absorbed the chemical often does not spread evenly but tends to travel to the regions of most active development. Demeton-methyl and schradan are the systemics usually employed in glasshouses (only commonly accepted chemical names are used here as materials are sold under many proprietary labels). Parathion

and Sulfotepp, which are related to them, are not systemic and are mostly used in smoke form as contact acaricides.

These substances are toxic to pests other than mites, but specific acaricides have been developed, many of them related structurally to the insecticides known as chlorinated hydrocarbons (DDT, BHC, etc.). Some are termed ovicides, that is to say they kill the eggs of the mite, but in fact they are often more effective against the immature forms hatching from the eggs. Their action is in some cases slow, and as the adults are not harmed the results of an application may at first appear disappointing. Azobenzene was one of the earliest ovicides and is still commonly used: the later developments include chlorbenside, Tedion, chlorfenson (PCPCBS) and fenson (PCPBS). Chlorobenzilate and Kelthane seem to be active against most stages of the mite, and Tedion, which kills eggs and immature stages, also affects adult females in such a way that for some time they lay infertile eggs. Although not true systemics, a number of these chemicals have the ability to penetrate leaf tissue so that, if applied to the upper surface, they are capable of affecting mites or eggs on the underside.

Chemical control not complete answer

It is now abundantly clear that chemical control has not yet provided the complete answer to the red spider problem. In some nurseries the mites are no longer affected by chemicals which once gave a reasonable degree of control, for example azobenzene and the organophosphorous compounds. In America, resistance to chlorobenzilate, chlorbenside, Kelthane, chlorfenson and Tedion is known.[5]

These resistant strains of red spider are thought to have arisen from the presence in populations of individuals differing from their fellows in some inherited aspect of their physiology, so that they have some natural immunity to a certain chemical or group of chemicals. This increases their chances of survival and if use of the chemical(s) is continued the proportion of resistant mites among the survivors will increase.

The grower is therefore faced with the practical problems of inefficient application and the possible presence of a resistant strain, and there is a danger of ineffective control measures being wrongly blamed on the latter, so that a useful material might be discarded needlessly.

It is up to the grower to ensure that the instructions for the use of chemicals are followed to the letter: he must give the substance every chance to do its job properly, and for the best results, control measures should be under careful supervision.

The choice of a suitable material and method is influenced by various factors apart from the ability to kill red spider—the condition of the glasshouse, the temperature, the plants to be treated, and whether safety regulations for handling the material and marketing an edible crop can be complied with.

No firm recommendations for preventing the development of resistant strains can be given, but it is obviously unwise to rely for control on one type of compound. Some variety is preferable even to the extent of appearing old-fashioned: white oil preparations will still kill red spider!

The acaricides on the market today are but a small fraction of those which

have been developed, tested, and then discarded for various reasons. In testing these materials problems of standardization must be solved; the materials themselves must be of known standards of purity; mite populations of uniform composition are necessary because of varying reactions of the colour forms; and Hussey and Parr[1] have indicated the importance of maintaining pure stocks for testing purposes. At least where systemics are involved, "uniformity" of the host plants is desirable, though whether it can ever be achieved is another matter.

One of the worst handicaps under which the chemist works is our ignorance of the physiology of red spider. For example, the genetics of organophosphorous resistance have been elucidated[6] but the mechanism of resistance is unknown, and there is little understanding of why some chemicals are potent acaricides while even closely related members of the same group are not. It is perhaps a measure of how little progress has been made in this field that one of the latest acaricides to be developed seems to act by trapping the mites in a viscous material applied as an emulsion. In 1913 the use of flour paste[7] was recommended for exactly the same purpose!

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READERSHIP SURVEY

IF you haven't yet sent us your completed questionnaire, enclosed with the November issue of *Agriculture*, we should be glad to have it before the end of the year.

Students at agricultural colleges and farm institutes, and other readers who see *Agriculture* in a library, are invited to ask their Principals or Librarians for separate copies of the questionnaire.

The First Royal Dairy Show

TOM BILLINGTON

IT seems fair to say that the 74th Dairy Show—and the first Royal Dairy Show—was outstanding, in that it got down to brass tacks in a way with which we have not always associated these events. Part of the credit for this improvement should go to the Council of the Royal Association of British Dairy Farmers, the organizers; part to breeders and herdsmen, and part to trade exhibitors.

I would say that a dairy farmer with an inquiring mind had far more opportunity for picking up useful information at this Show than at many of its predecessors. It was more of a farmer's Show and less of a manufacturer's.

This last point was exemplified in the much better siting of such exhibits as those of the Ministry of Agriculture and the Milk Marketing Board. In former years these stands have been tucked away down in the cattle lines where they were unable to make a good showing. This year they were given excellent positions in the National Hall, which used largely to be occupied by heavy dairy machinery and equipment, all very interesting possibly for the milk retailer but of no earthly use to the ordinary milk producer.

Space in the National Hall was used this year to stage a Farm Buildings Section, and right well did all the exhibitors, including the two already mentioned, rise to the occasion. It would have been possible to spend an interesting and instructive day in this section alone.

While passing a tribute to the trade and educational exhibitors I should mention that very many illustrated the points they wanted to make by including demonstrations of live animals, and that surely is the best way of calling attention to a point and ramming it home. Someone said there must be nearly as many live animals on the trade stands as in the Show cattle lines. Possibly this was an overstatement, but not too badly so.

It has often interested me to note the way in which either live animals or something with movement will attract visitors to a stand. In this way I thought the M.M.B. exhibit struck a good note. By a series of pictures on endless canvas belts, they told the stories of milk, cheese and butter. The whole lot took 4½ minutes to go through, and the pictures were of such outstanding quality that once you started looking at them you felt bound to follow them to the end.

On the machinery stands two things were particularly noticeable: the many displays of equipment for bulk handling and cooling of milk on the farm, and the increased interest in circulation cleaning with detergents.

The F.M.C. and other exhibitors demonstrated the housing of veal calves and baby beeves on slats. When visiting the Corporation's stand the Queen Mother asked if this was the system there had been so much controversy about. Mr. Edward Bowden, F.M.C. Chief Livestock Officer, assured her that the keeping of calves tied up by the neck in the dark was not advocated. They could move about, stand up or lie down on the slats, there were plenty of windows and fresh air and there was nothing cruel about it. Certainly the calves looked perfectly happy and contented.

Surely the organizers did a good job in initiating the live/dead class for bacon pigs, which aroused considerable interest. Entries were confined to eight pairs of Large White, eight Landrace and four Welsh, and the last-named breed scored a great triumph in taking the first three placings. One pig from each pair was judged as a carcass on the Tuesday and the other pig on the hoof on the Wednesday. Code numbers were allotted, so that the judge had no idea which carcass paired with which live pig. Sir John Hammond acted as judge, and he came out of it with flying colours, for there was a marked correlation between the carcasses and the live pigs.

The winning pair were a good example of this. Sir John awarded the maximum of 100 points to Frilford Farms' Welsh carcass and 81 points (third place) to its live mate.

Interest in the live pig section has been growing since its inception four years ago. I understand that plans are afoot for a considerable extension to this section next year and in such a way that the interest should be even keener.

The section for live animals demonstrating beef from dairy herds, new last year, drew an entry of 37, compared with 30 in 1959. This is another innovation which seems to have caught on well. British Friesian breeders must be given credit for the way in which they have jumped to this opportunity of proving that their breed is one of single purpose with a dual result—a term their Society prefers to the controversial one of dual-purpose.

In the splendid display of cheese Mr. J. D. Goodwin, of Ash House, Brindley, Nantwich brought off the excellent achievement of winning the Lonsdale Trophy for the champion farmhouse cheese for the second year out of three, having won the Cheshire farmhouse cheese championship five times.

Cheese has been made on Mr. Goodwin's farm for over 100 years, of which he has been making it for 30. He is a great believer in Shorthorn milk for this purpose and milks between 80 and 90 of that breed.

Certainly the cattle in the eight breeds represented showed marked improvement in udders and in general "workmanship" compared with those we used to see about ten years ago. Gone were the ugly, pendulous vessels and awkward teats of bygone days. The best of the cattle of all breeds, including those formerly noted for their badly shaped udders, now paraded with reasonably trim and workmanlike bags and teats.

To my way of thinking the breed teams seen in the competition for the Bledisloe Trophy, and indeed through most of the breed classes, were a businesslike lot which looked as though they were expected to earn their living in their home quarters as well as looking fine on parade at Olympia. They were indeed a credit to their breeders and herdsmen.

This improvement, I believe, is a sign of the times. The financial shoe is pinching much harder in milk production; competition between the various breeds is red hot. Only the best are now good enough to carry their breed colours at Olympia.

The Potato at Home

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Potatoes came to Europe from South America. Back from his recent visit there, Dr. Dodds describes some of the great variety of South American types, and reminds us that they may still help to improve our own.

THE potato is a plant of the New World. It is grown from Venezuela more or less continuously down the Andes as far as the northern Argentine. There cultivation stops because the mountains become barren and uninhabited. Although the potato is distributed within the tropics of both hemispheres, its cultivation is limited to high altitudes where the temperatures are similar to those of the temperate zones. The potato that we know in Europe is called *Solanum tuberosum*, and is a tetraploid with 2n (4x)=48 chromosomes. In South America, most of the cultivated varieties are also tetraploids but, to comply with the International Rules of Nomenclature, they must be referred to as *S. tuberosum* subsp. *andigena*, even though they are the progenitors of the European varieties. There are also diploid, triploid and pentaploid potatoes in South America with 2n=24, 36 and 60 chromosomes, respectively.

Are the diploids the progenitors of the cultivated tetraploids? Do they merit the classification into species that has been accorded them? How have the odd-numbered polyploids arisen? It was to try and get information on these and other questions connected with the evolutionary history of the potato that Dr. G. J. Paxman and I spent four months recently in South America. We began our journey in Venezuela and travelled southwards over the entire range of cultivated potatoes: through Venezuela, Colombia, Ecuador, Peru, Bolivia, the Argentine and Chile.

Life of the Indian growers

Most of the potatoes of interest to us are grown by the Indians. Nowadays there are more than five million American Indians in the Andes, and their everyday life as agricultural peasants is still very similar to that of their forebears the Incas. These people seem to have emerged on the altiplano of southern Peru, in the Valley of Cuzco. They built up an empire stretching from Colombia to the Argentine, from the desert coast to the eastern jungles, that was supreme until the Spanish Conquest.

As people, the present day Indians are very variable but, nevertheless, they all have an underlying resemblance one to another; they are of medium height, heavily built, and have broad faces with high cheekbones, prominent noses and somewhat Mongoloid eyes. Their single-roomed houses, like those of Inca times, are made of sun-dried bricks, or of field-stone plastered with "adobe" mud. There is neither chimney nor fireplace and it is a common sight to see smoke seeping through the thatch as the evening meal is cooked. In some parts, the foot plough is still used, but it has mostly been superseded by an iron-tipped wooden plough (with a hoe-like action) drawn by bullocks.

The wonderful Inca terraces, by far the greatest of their kind, are now no more than picturesque ruins, reminders of a skill that has been lost; instead, the peasant practises a shifting cultivation over the altiplano and across the mountainsides, often in extraordinarily precipitous and inaccessible places. What produce there is for the market is brought out by bullock and mule pack. The peasant's life is one of incessant toil if he is to survive: the crop varieties are poor, the soil usually eroded, thin and infertile, and the climate harsh. The chewing of coca (*Erythroxylon coca*) was the habit in pre-Inca times and the leaves are still an everyday commodity in the markets. The peasant carries a little woollen sack filled with coca leaves; he chews a wad of them with a pinch of lime and swallows the juice. It makes him less sensitive to cold and fatigue—but continued addiction brings about physical degeneration. Another stimulant used in the Andes is a drink called chicha, made from fermented corn; it is mildly intoxicating and noticeably popular on market days after the serious business of the day has been completed.

There is no organized trade in seed potatoes and the local market therefore plays an important part in the preservation and dissemination of potato varieties. Usually it is held on a Sunday morning and is a combination of market and fiesta. All the local people from within a radius of a few miles attend if they possibly can. Often, the samples of produce offered for sale are very small; for example, a handful of potatoes sufficient only to plant a patch near the house.

Country and crops

The interior of South America is dominated by the Andes, with their great peaks (often more than 16,000 feet high) and vast series of high valleys. There are many large estates in the valleys, but the overall impression is that of a peasant agricultural economy. In the bottoms of the valleys and along their lower slopes, coffee, sugar cane, rice, bananas and maize are grown and some of these, together with cotton, are the dominant crops of the coastal plains that fringe the mountains. At about 8–9,000 feet the tropical plants disappear and are replaced by wheat, barley, beans, onions and potatoes—crops that demand temperate climates. The land above about 11,000 feet is a high plateau called "altiplano" in Bolivia, "paramo" in Venezuela and Colombia and "puna" in Peru. It is scrubland with many succulents, and provides land for cultivation as well as rough grazing for herds of goats, sheep and llamas. Some of the peasants are fortunate enough to have land both in a valley and on the plateau, but many are entirely dependent on the latter.

Potato strains

Potatoes are grown either in the valleys at about 8–9,000 feet or on the altiplano at 11,000 feet or more. Broadly speaking, there are two groups—"Chaucha" and *andigena* varieties. Chauchas are grown by the peasants mainly for home consumption, though a little of the crop may be sold in the village markets. They are potatoes with a short growing season of from four to five months, and the tubers lack dormancy. There are many local varieties with different shapes and skin and flesh colours and they are particularly

valued for their good taste. They are usually diploids with 2n=24 chromosomes.

If the peasant has a large enough holding to grow potatoes to sell in the local markets he grows *andigena* types, as do the large estates. These give higher yields than the Chauchas but are even more variable: round, oval, sausage-shaped, smooth or knobbly in shape; black-purple, red, white, spotted, streaked or spectacled in skin colour; white and yellow in the flesh. They are tetraploids with 2n=48 chromosomes and are slower in growth than the Chauchas; thus, Papa negra, a popular *andigena* variety that is grown in Venezuela, takes about a year to mature on the altiplano though it develops in about nine months at 9,000 feet. More and more of the peasants are learning to appreciate the value of *andigena* varieties, which are therefore tending to displace the Chauchas. In turn the *andigena* potatoes seem likely to be replaced by *tuberosum* types, which have quicker maturity and tubers that conform to the temperate standards necessary for commercial potatoes. Although there are these signs of a very gradual transition to more sophisticated methods of growing and marketing, every South American country still has a long way to go to reach European standards.

Poor yields in Venezuela and Colombia

In Venezuela, indigenous potatoes are found in Tachira and Merida, the two western provinces nearest to Colombia, through which passes a branch of the Andes with peaks up to 14,000 feet. Only about 15 per cent of Venezuelan potatoes are grown in the high Andean zone, however. Instead, *tuberosum* types are cultivated at lower altitudes (2–7,000 feet) from seed imported from Canada and Europe. Although these yield more than the *andigena* tetraploids, even under an 8–10-hour day, the average yield is poor—very roughly (and optimistically) 2 tons an acre.

Colombia has much land where high yields of potatoes could be achieved, notably in the plain of Bogota, situated at 8,500 feet between the Central and Eastern Cordilleras. With indigenous potatoes, however, yields of little more than 2 tons per acre are obtained and considerable quantities are imported from North America to meet the country's needs. Attempts are being made to breed improved varieties by combining some of the characters of *tuberosum* (fewer but larger and smoother tubers, shorter growing period) with the ecological adaptation of *andigena*. It seems highly probable that, ultimately, such varieties will displace the indigenous ones.

From Cucuta, on the north-eastern border of Colombia, to Bogota, there is a well established trade in a diploid variety called "Amarilla". It has a rather knobbly tuber with an unpigmented skin and deep yellow flesh. The variety, which may contain more than one component clone, is a favourite for stews and soups and also liked for frying; it can fairly be described as a commercial variety.

Distribution patchy in Ecuador

Two ranges of mountains, the Eastern and Western Cordilleras, pass north and south through the length of Ecuador, the country which straddles the equator. These ranges are relatively close together and, with the inter-

vening valley, form what has been called "The Avenue of the Volcanoes": Chimborazo, used by Bouguer in 1740 to measure the earth's mass, Sangay, in constant eruption, Cotopaxi, the highest active volcano in the world, Pinchincha, Antisana and Cayambe are some of them. The main valley (9–11,000 feet above sea level) and others in the ranges are intensely cultivated, and a great variety of potatoes, whether *andigena* or Chaucha, can be collected from a single field.

From Ibarra southwards to Quito, through a strip of country about fifty miles wide, potatoes are not grown. This is a hot and desolate region of scrubland, over-grazed (chiefly by goats) and badly eroded. Immediately south of Quito, the interandean valley has a gentle climate that permits the cultivation of an astounding variety of crops on the small farms—plums, capellins, almonds, cherimoyers, nectarines, pears, apples, potatoes, barley, maize, beans, lettuce and onions. Irrigation is used and permits the production of three crops of Chaucha potatoes per year. As in Venezuela and Colombia, Chauchas are also grown higher up on the plateau, where yields are said to be greater. The main region of potato growing is a little further south (around Ambato and Latacunga) where the climate of the valley is a little cooler; here *andigena* types are grown to supply Quito, but Chauchas are also grown for home consumption. The extreme south of Ecuador is very sparsely populated and without roads.

Indian influence marked in Peru and Bolivia

The coastal belt of the northern part of Peru is a desert but, as in the steep, narrow valleys of the Western Cordillera of Peru which are hot and dry, crops such as cotton, sugar cane, bananas, rice, tobacco and maize are grown under irrigation. Gradually, with increasing altitude (and rainfall), they give way to maize, beans, potatoes, cereals and stock. The towns, such as Huancabamba and Cajamarca, are in the valleys that lie between the West and the Central Cordilleras. These settlements are virtually self-supporting and most of their produce is consumed within the valley. Chauchas and *andigena* types can be seen together in mixed plantings of potatoes, maize and beans.

From Pasco, about half-way down Peru, southwards into Bolivia, the Indian influence is very marked. Here Quechua, the language of the Incas, is spoken. As a result, varietal names change, though the Spanish word Chaucha is still used to signify potatoes that mature early. Variability increases as one travels southwards until, in the region of Lake Titicaca, it becomes bewildering. There are diploid potatoes which neither sprout nor mature early and are indistinguishable in appearance from *andigena*. Diploids, triploids, tetraploids and pentaploids can be seen growing together in the fields that border the lake. Here is the centre of origin of the potato and here, too, is the most primitive agriculture.

Reservoir of genetic variability

Apart from the spectacular ruins of stone cities and fortresses, the only tangible relic of Inca times is the wealth of plant variability that they produced. What use can we make of this today?

The potato was introduced into Spain from South America towards the

end of the fifteenth century and spread from there through Europe; tubers may also have been brought into the British Isles by the Elizabethan voyagers. Whatever the true story of the introduction may be, it is clear that the original material was very limited in extent; and equally clear that most of our many *tuberosum* varieties have been developed from this limited sample. Only very recently have potato breeders in the temperate zones returned to tropical America in search of useful genetical variability. Thus the Mexican wild species, *S. demissum*, has been used as a source of resistance to late blight, and another Mexican wild species, *S. stoloniferum*, may provide resistance to virus Y. Besides high performance, other resistance factors have been found within *S. tuberosum* itself; for example, field immunity to virus X and field resistance to potato scab and late blight. With this work in hand, aided by modern plant protection and sanitation techniques, it is difficult to avoid the conclusion that our potato production is reasonably secure and efficient. Undoubtedly, a great deal of useful breeding can be done with *tuberosum* lines already developed in temperate countries. In support we have the South American cultivars, whether diploid or polyploid, which form a great genetic reservoir, available in case of specific need to provide qualities not readily available otherwise.

Market Gardening on a Shoestring

E. H. SULLIVAN
Winterbourne, Bristol

Mr. Sullivan began market gardening in 1945, with no experience, only £395 capital, and the wish for an outdoor life. The first few years were very lean, but the enterprise staggered from one improvement to another, and the N.A.A.S. came to his rescue more than once.

ON leaving the Forces in 1945, advised to find myself an open-air occupation, I chose market gardening, thinking of "a few acres and freedom". In sixteen months' very instructive practical training in south Cornwall, I had my first contact with broccoli, spring cabbage, early potatoes, chrysanthemums and hothouse tomatoes. A further course followed at a training centre; the theoretical knowledge gained there has since proved invaluable, and so have the many practical hints picked up during visits to other institutions and growers.

Training came to an abrupt end in October 1947 so, with holdings everywhere being sold at fantastic prices, and no County Council places available, I started on my own at Winterbourne, near Bristol, where my parents owned about 1½ acres of land. This consisted of half an acre of old orchard and an arable field thick with couch grass. I took over the land from 1st November, with a capital of £395, a head full of theory, a heart full of hope and an ancient wheel-barrow containing a few well-worn tools!

Five gallons of gear oil

There seemed to be no second-hand tractors available, so I was only too easily persuaded to spend £200 on a new two-wheeled tractor with the necessary cultivating implements. The salesman even talked me into buying five gallons of gear oil, which subsequently took ten years to use up—on anything but the tractor! With this machine I was able to carry out all necessary cultivation for the next few years.

That first winter I had nothing to sell but a small patch of savoy planted the previous July. Eventually I was offered £25 for the piece, the buyer to cut. I refused, missed the market, and finally had to cut it myself for about half the original offer. Since then few marketing opportunities have been missed.

In the spring of 1948 I was able to obtain a grant of £150, which I put towards the cost of 250 Dutch lights. At this time too, my brother, who had trained as a gardener at Bristol Zoo, decided to join me. When the lights arrived we removed the tiles from an old pigsty, replaced them with a few of the frames, and made our first "glasshouse". In it we raised our tomato seedlings. Meanwhile, we found that it would cost about £170 for a framework to make a Dutch light house so, using an idea picked up in my travels, we had angled brackets made, drilled eight holes in each frame, bought fourteen pounds of five-inch nails, and erected a temporary structure for about £12. Water was then laid on and the subsequent tomato crop brought in about £100.

The remainder of the ground was filled with the usual crops, such as early potatoes, peas in succession, runner beans on strings and lettuce, some of which we retailed, the rest going to one buyer. However, the ground was poor, and the few crops which survived the slugs were also poor, so we had to supplement our income by jobbing gardening. We were then offered the tenancy of a further 2½ acres of sadly neglected land, and cleaning this and grubbing out the old orchard kept us fully occupied for the winter of 1949-50. The Dutch light house was dismantled and re-erected over lettuce which later proved quite profitable.

During the second year we partially controlled the slugs by running poultry over each section of land as it became vacant, and before re-cropping. This, together with frugal application of fertilizer, improved the quality and quantity of the crops.

Wholesale delivery to shops tried

It was obvious that transport was needed so we bought a second-hand 15 cwt truck, on a good recommendation, for a borrowed £200, and started a wholesale round to shops. To keep a regular service we supplemented our own produce by buying from other small growers, and eventually the lorry paid for itself. I might add, however, that it was no bargain. The rear wheels wobbled so much that the brake-springs played quite an ominous tune as it was driven along, making us live in fear of the Ministry of Transport inspectors! As funds became available, we replaced all worn parts and when it was sold two years ago for £15 it was mechanically sound throughout.

It seemed to us that local tomatoes were a profitable line, so a small

propagating house was built, to be followed a year later by one measuring 110×30 feet—both on borrowed money. During this time, too, we ventured unsuccessfully into pig production, mainly to obtain manure, and received further setbacks when two shopkeepers defaulted to the tune of £150.

The next few years were still lean ones, in spite of the renting of four more acres. We bought drip-feed irrigation plant for the tomatoes, and built up stocks of pots for early cauliflower and late chrysanthemum production, spending the remainder of our cash on manure, fertilizers and a contractor to carry out the larger cultivations.

In 1956, with the increased amount of produce, it became necessary to supply a wholesaler, especially as we were now the sub-tenants of a further six acres, previously used as a pig farm. To plant our brassicas we bought a planting machine. The expected profits did not materialize, however, as the following winter was wet, and this, together with the large quantities of nitrogen available, made the savoys and sprouts grow too large and too soft for marketing.

Over the years the business has developed in a haphazard way and, despite frequent advice from the N.A.A.S., although we were able to keep up with the cost of living we could not overtake it, and by 1958 were seriously considering selling up.

In January of that year we had purchased a second-hand two-ton lorry for £50 which, in contrast to the previous vehicle, gave us a year free from repair bills. The N.A.A.S. once again came to our rescue by arranging help from Bristol University Economics Department, who enabled us to work out a much better plan of action. We also took over the tenancy of the pig farm and, feeling more secure, bought a four-wheeled tractor and some necessary cultivating implements. In 1959 two acres of our rented land were taken for building purposes, but we were amply compensated. With our remaining twelve acres we now rarely supply direct to shops, because by growing larger and less varied crops we find it more advantageous to clear quickly to wholesalers.

We still have our problems—a pipe-line is scheduled to go through one plot, a new road through another, and a third is threatened with a road-widening scheme. If the reader knows of a suitable holding in a safe Green Belt, preferably within reach of Bristol, and would kindly let us know, we should be delighted to contact our bank at once to arrange an overdraft!

Farmer-Consumer Committees

A. W. GALILEE

National Farmers' Union, Warwickshire

Farmer-consumer committees, says Mr. Galilee, are among the best allies the British farmer has against foreign competition. And they can give consumers a good idea of the problems farmers have to face and how they are being overcome.

WHAT is believed to have been the first farmer-consumer committee in the country was set up in Warwickshire in 1954 by the County Branch of the N.F.U. The idea was hatched by the Regional Information Officer of the Union, Mr. Leslie Thomas, and the leaders of the County Branch wasted no time in fostering the young chick. For some time they had wished to know at first hand what quality produce the housewife wanted, how she wanted it, and when; and here was their chance to find out. In other words this was not only the forerunner of many similar committees in other parts of the country, but also a very modest beginning to market research in agriculture. This searching of the consumers' mind is now an essential preliminary to the setting up of any agricultural marketing organization.

Goodwill built up

As a comparative newcomer to this county, I am really amazed to find what a wealth of goodwill this committee has built up between producers and consumers. The farmers who serve on it seem always to go away feeling that their time has been well spent (and how often after a committee meeting can anyone touch the heart and say that!), and the women are exceedingly keen to attend the meetings to put not only their own questions, but those of the many hundreds of consumer members whom they represent. It is estimated that the members of our committee represent around 70,000 women, through such organizations as Townswomen's Guilds, Housewives' Leagues, etc.

Meetings are held quarterly, and whenever possible it is arranged that the ladies assemble at County Headquarters, to be taken by bus or car to some outside venue. Nothing delights them more than to see at first hand food being produced, harvested, graded or packed, and for the process to be described by an expert. To my mind it is most important that they should be shown as much as possible of the production cycle, and also of what happens to food between the farm gate and the shop. When they visit farms they are better able to understand the farmers' difficulties, and the extreme trouble that producers go to in ensuring that top quality food is turned out. They are always astounded at the cleanliness in the cowshed and dairy, and the opportunity is never lost to give details of the capital outlay on live and dead stock. It also opens their eyes to visit a grading and packing station, to see the great care that is taken to make sure that only first quality goods are supplied to the shops. At that stage they realize, probably for the first time, that it really pays to buy graded, branded *British* produce.

Eggs are a classic example of this. Everyone remembers the outcry that an egg stamped with the lion could not possibly be better or fresher than an unstamped egg with plenty of dirt on it as its trade mark. A visit to a packing station quickly kills that fallacy. Now housewives buy the lion egg with confidence. Another decided advantage is that they become staunch supporters of the Marketing Boards, for the simple reason that they realize that the Boards stand for quality and a fair price.

Interest in prices

"Value for money" is quite understandably uppermost in the women's minds. If they think any commodity is dearer than it should be, they want to know why, and will not be put off by any old story. Therefore it is always sound policy to try to have a farmer present at meetings who understands the price build-up. In this connection the constitution of the producers' side of the committee is important. We try to guard against most eventualities by having commodity committee chairmen on the committee, together with current office holders and three or four past county chairmen. Criticism of prices is usually just the opportunity that producer members have been waiting for, to kill any ill-informed press publicity.

Representatives of the local press are always invited, and never fail to turn up in force. The reason is obvious; what better than food prices to make headlines? From the producers' point of view this publicity is a good thing, because it enables them to have their side of the story conveyed to the consuming public. Of course the press love question time, and no matter where the meeting may be it is essential to allow sufficient time for questions on any subject. The women have to satisfy the queries of their members, and the only way they can do this is to have time to put their questions. In practice they always get their questions in, no matter what time it may be!

Incidentally, the television authorities are not averse to sending their camera crews along to outside functions, if they are given sufficient notice.

Good publicity for home-grown foods

These committees, if properly run, cannot help doing good. We firmly believe that they are one of the best weapons the British farmer has against imports. This is most important now, but it could be much more important in the future, especially if it is decided that this country should join the "six". If that happened there would be no tariff barrier, and the slogan "Buy British" would then become of paramount importance, if producers in this country were not to catch a cold from the "wind of change" blowing off the Continent.

The housewives on the producer-consumer committees prefer home-grown food, buy it whenever they can, and what is more they advise their members to buy it. These women are probably the best unpaid publicity agents that British farmers can find. They make a publicity avenue that should be exploited to the full.

Wise Winter Feeding

IAN MOORE, M.Sc, PH.D., N.D.A., DIP.AGRIC.(CANTAB.)
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Grow the right foods economically and well, feed them accurately, and cut out waste. If you also "plan for a long winter and an early spring", your livestock will thrive and your profits increase.

WINTER is upon us! Now comes the real test to prove whether our cropping plans for meeting the needs of our livestock during the difficult months ahead were well formulated and skilfully executed. Moreover, now comes the test of whether our standard of crop husbandry is equal to the needs of our livestock husbandry. On most farms today the aims are to maintain the health of the stock and secure maximum production at minimum cost. Thus most farmers rely extensively on home-grown foods, and economists and farmers are in close agreement on this point.

It is always wise in formulating a cropping policy to plan for a long winter and an early spring—surely something of a paradox! However, this is not so, as even with the best laid plans spring may be long delayed and the resources of winter fodder stretched to the limit. As winter feeding is expensive, the shorter the period, the greater the possible margin of profit. Hence the essential need to hasten spring by having catch crops of rye or ryegrass available and by using that powerful tool of grass production, nitrogen, in an effort to secure really early spring growth. Moreover, if you have planned along these lines, but Nature herself kindly brings an early spring, this is merely a cause for rejoicing. To start the summer with a surplus of winter fodder on hand is a sound insurance against drought. Many's the time I have been profoundly thankful for such a reserve of fodder to fall back on in high summer, when even the cocksfoot leys were burnt bare by drought. There can be few greater comforts to a livestock farmer than to have an unopened silo or a stack of hay to meet a summer emergency.

Complete records essential

But now to the business of winter feeding. Obviously, in planning this the first step is to have a complete record of the foods on hand—both quantitatively and qualitatively.

When you are relying on large quantities of succulent food, the dry matter content is of paramount importance—a fact which is only now being fully realized by farmers generally. For silage, hay and dried grass, the protein content must also be known if sensible rations are to be compiled. The wise man takes full advantage of the services of the N.A.A.S. or the advisory officers of the commercial firms in this connection, and if this article fulfils no more useful function than to indicate how supremely valuable these services can be, I shall feel fully justified in putting pen to paper. In addition to knowing the analysis and the quantities of food available, you will obviously have to know the numbers of livestock in the different age groups

Silage fed to in-lamb ewes. There is scope for a much wider adoption of this practice.

Photos: *H. Ian Moore*

Feeding kale harvested by machine on old pasture behind an electric fence.

Wise Winter Feeding (Article on pp. 468–71)

A clean sweep with the forage harvester: surplus kale should be ensiled.

Photos: *H. Ian Moore*

An example of leaf fall. In this crop it accounted for a loss in yield of 40 per cent.

Photo: *W. A. Motley*

Some of Mr. Motley's 2,500 portables: they are always on fresh grass.

Photo: *Poultry World*

The sort of carcass to aim at.

Photo: *Forestry Commission*

Timber-growing is a profitable use for catchment land, where, for example, hygiene often rules out keeping livestock.

Woods and Water (Article on pp. 476–7)

and the probable length of the feeding period. Food can then be adjusted to stock needs and a balance sheet drawn up.

Making the best use of kale

The succulents and crops which deteriorate as winter progresses will naturally be fed first and in maximum amount. Kale comes into this category, and few fully realize the damaging effect of frosts and bad weather. Leaf fall, woodiness and unpalatability increase the longer the crop is left standing. Lodging, too, during stormy weather such as we experienced in the south west in September, may result in wastage. Such factors may reduce the value of the crop by as much as 40 per cent or more. And you must not forget the problem of poaching on heavy land, when kale is grown for folding. On stony ground considerable foot trouble in cattle may arise, and in such cases it may pay to cut and cart off. Here the forage harvester comes into its own. It is an expensive tool used mainly for silage-making, but when it is fitted into a farming system based on grass and kale the overheads are considerably reduced. Thus, to quote our own experience on the College Farm, the forage harvester is used throughout the grass growing season for zero grazing and silage-making, and until Christmas it can be used for harvesting kale grown on difficult soils or inaccessible sites.

Considerable scope exists for the greater use of the forage harvester in kale which can then be fed on tough old pasture, or a ley due for ploughing out, using an electric fence as shown in the illustration on p. i of the art inset. On farms where zero grazing is practised the harvested kale will naturally be fed in the same yards. Incidentally, we have found that an offset machine provides much cleaner food than the in-line machine, with correspondingly less soil contamination.

In the main, however, the electric fence is the commonest way to use kale—wise planning will have ensured easy access to the field, so when starting it simply remains to open up ready for grazing. The simplest procedure is to cut and cart off the kale from a strip or block to allow the fence to be set up. To avoid bullying, crowding, unnecessary wastage and to lessen the chance of the fence being pushed down, it is advisable to allow 3 yards of frontage per cow. Cases of bloat have been recorded with cows folding kale, and it is a wise precaution to feed a little hay before turning on to kale. Particular care is needed in frosty weather. In spite of the high water content of kale, cattle still need access to drinking water. Incidentally, always assess carefully the quantity of kale available, especially in a season like this; if the supply is likely to last well beyond Christmas, the extra cost of ensiling the surplus is fully justified.

Other roots and cabbage

On many farms where kale is grown, sugar beet tops will be available at the same time. As with kale, they should be secured as free from soil as possible. Dirty tops may hold 16 per cent or more of sand, which is not of high feeding value! Sheep are ideal for folding off tops, and would be my first choice. The waste with cattle is often high, and I prefer to cart the tops to them on grass or in yards, but whether fed to sheep or cattle they must

first be wilted. Any surplus to immediate requirements should most certainly be ensiled.

Fodder beet is by no means as popular now as it was a few years ago, but it is still grown by many on account of its high dry matter content and the long period of usability. Unlike mangolds, which must first ripen before being fed, fodder beet can be used right through the winter. The tops must be wilted to prevent scouring.

On farms where swedes are grown, the order of feeding is determined by their keeping quality, which is in direct relationship to their dry matter content. Purple-skinned swedes should be followed by bronze and then green-skinned varieties, which may be folded off or clamped. Swedes left growing to run the gauntlet of frost, benefit from the protection afforded when two rows are pulled and placed in a deep furrow which is then ploughed back to cover the roots. With this treatment the tops, which remain green, provide additional succulent food. Mangolds, of course, owing to their excellent keeping qualities, will be kept until the end of winter. A clamp of mangolds in a late spring is a great boon to those with milking cows or suckling ewes.

Now kohlrabi stands frost a good deal better than swedes, and can be left growing if need be until required for feeding. The skin is tough, and when fed to sheep the bulbs may need to be cut so that sheep can get at the succulent flesh inside. Since cabbages cannot be stored and suffer badly from severe frost, it is wise to consume them as soon as possible, the early and late drumheads first, then the cattle savoys and lastly, in the New Year, the flat polls, the late purple variety being the hardiest of the lot. Cabbages are easy to feed, can be rationed simply and fairly accurately and have the advantage that, should the need arise, they can be fed immature, though weight is thereby sacrificed. When the stumps are left, new growth is thrown out which makes useful keep for sheep. A good plan on many farms, incidentally, is to alternate cabbage and mangolds on a piece of favourable ground near home. As the fertility of the soil is built up, massive crops and a long sequence of fodder can be obtained.

Hay and silage

So far no mention has been made of hay and silage, those incomparable twins for winter feeding—incomparable, however, only if the quality is high. Obviously, perishable foods will be consumed first and hay and silage can wait their turn, except where small quantities of hay are fed to offset the laxative effects of other foods. A carry-over of hay is much simpler to accommodate than silage, and is always saleable. Given the choice I would keep back the hay. Even so, it is well to remember that in a summer drought with pastures burnt bare and milk yields falling rapidly there is no *cheaper* way of steadying production than to feed silage—if one has it! With both these fodders the best quality should be reserved for the youngsters and the high producers. Then again, not enough use is made of silage for lambing ewes, which milk well on it, and even suckling sows relish really good silage made from short grass or lucerne.

Skilled execution of a sound cropping plan allied to complete mastery of the feeding art will be of little avail, however, if the problem of wastage is not tackled with vigour and without cessation. Food costs are a major item

in the total cost of producing any form of animal product and efficiency in feeding, therefore, is most important, especially as profit margins become increasingly smaller. The use of well-balanced rations for each class of livestock is a *sine qua non* for profitable farming, but any discussion of this problem is outside the terms of reference of this contribution. However, I would like to enter a strong plea here for more attention to profligate waste. Roofless hay ricks, uncovered silage pits, the loss due to the depredations of rats and mice in stored grain and the loss from frosted roots annually account for a considerable financial loss on far too many farms. Frequently the plea is shortage of labour, but no such plea is tenable when wanton waste of costly home-grown foods is involved and the solution to the problem is largely a question of using forethought.

Then again most feeding jobs are repetitive, and hence a slightly overgenerous daily ration mounts up to a very appreciable annual tonnage of food. Occasional checks on the quantities of silage or hay or even kale and roots fed are sound practice. Complete mechanical feeding involves considerable capital outlay and is still a pipe dream on the majority of farms. Yet so often wastage is more rife on the very farms which can least afford it—the small ones. The large farmer annually securing 1,000 tons silage *may* be in a position to afford side waste in the clamps resulting from lack of coverage, *may* well afford to have silage left in the troughs as a result of overfeeding. The odd scoopful of concentrates thrown in to make sure the ration is adequate may not be regarded as wilful extravagance, but over the season it can make a big hole in the profits.

Here then is the essence of efficient winter feeding. The right foods grown superbly and at a minimum cost, correctly balanced for the specific purpose in mind, accurately fed day by day, with wastage in all forms due to internal and external causes ruthlessly eliminated. A counsel of perfection, you may sigh. Yes indeed, but well within the capacity of the farmers who read this JOURNAL, many of whom have already distilled the essence to near-pure spirit. May their influence spread to the less well-informed.

Mechanical Handling at a Fruit and Vegetable Market

G. CRABTREE, A.I.AGR.E.
National Agricultural Advisory Service, Yorks (West Riding)

Sheffield's new market will have room and scope for the use of mechanical handling equipment. Mr. Crabtree describes a recent exhibition there which showed the range of equipment available and the uses to which it can be put.

AN interesting exhibition of mechanical handling and refrigeration equipment was held, under the auspices of the Horticultural Marketing Council and the Sheffield City Council, on the site of the new Fruit and Vegetable Wholesale Market, Acres Hill, Sheffield, on the 18th, 19th and 20th October 1960. The new market, which will cover some 40 acres, is designed to facilitate the use of mechanical handling systems, which must in the long run be to the economic advantage of growers, wholesalers, retailers and the ultimate consumer. All traffic routes leading to and from the market are clearly signposted and allow easy entry and exit. A special feature of the market layout is the segregation of transport, wholesalers' vehicles being isolated from buyers' vehicles, enabling them all to move freely and quickly and avoiding the congestion so general in wholesale markets. Parking space is provided for 650 vehicles for buyers and 350 for wholesalers, all the parking bays being coloured red and white alternately to make parking easier. A number of trees have been planted in the market area: the surface is cobbled, allowing water to penetrate to the roots, and the cobbles can be removed as the trees develop.

There were 17 exhibitors showing a wide range of equipment, including fork-lift trucks, platform trucks, pallet trucks (both battery and diesel driven), conveyors and elevators. There were also exhibits on refrigeration, hydrocooling and chilling. The Potato Marketing Board stand showed wooden stillages with a capacity of 6 cwt, using 28 lb cardboard packs; 14 lb canvas bags and 56 lb octagonal cardboard drums, suitably vented for new potatoes, were also demonstrated. There was an exhibit by the British Standards Institution and Horticultural Marketing Council, suggesting alterations to horticultural packages to make them fit the standard pallets which already exist.

Fork-lift trucks

A complete range of petrol, diesel and battery-electric fork-lift trucks were exhibited, ranging from the small pedestrian controlled truck (capacity 1,000 lb) up to the rider models (capacity 2 tons or more). Where conditions are suitable the fork-lift truck can entirely eliminate manual effort and fatigue, but they demand permanent roadways of suitable material, such as concrete, if they are to work efficiently, because of the small diameter wheels which are normally fitted. For prepacking stations where a large volume of goods,

packed in suitable containers, have to be handled daily on level floors, their usefulness is unlimited. Their value for agriculture, however, is limited by the lack of suitable floors and roadways on most farms for the small wheels of the trucks. A number of hand operated pallet, stillage and stacking trucks up to 2 tons capacity was to be seen. The length of the forks and the height of lift can be varied to meet most needs.

Also shown were a number of low-loader platform trucks which enable the driver to pick up and transport loaded or unloaded stillages without leaving his seat. There are two versions of this type, the elevating and the fixed platform. On the elevating platform truck the platform can be lifted hydraulically by power or hand pump. Many fork-lift trucks cost as much as £1,800; this price would include battery and charger in the case of battery-electric models. For agricultural and horticultural use a smaller and cheaper model would probably be suitable where the needs justify this type of equipment.

Conveyors

A representative selection of conveyors was shown at the exhibition. Installations can be designed for different applications, installed from floor to floor or from building to building, and will save hours of valuable time. Conveyors may be fixed or portable, gravity roller or powered; for the weight moved the power absorption is small. One well-known agricultural engineer had on show a range of power conveyors for agricultural and industrial use, in which the same component parts were used for both duties. Mechanical conveyors and elevators have been in regular use on farms for many years, especially for the potato and sugar beet crops where delivery height is essential.

A wide range of pallets and containers suitable for pallet handling were on view, some being reversible and others not. Pallet sizes may have to be modified to meet national and international standards which have been agreed: 40×48 inches and 32×40 inches are two of the sizes suggested. Existing bushel and half bushel boxes do not at present fit the standard pallets. Wood containers seem to be more popular than metal ones, no doubt because wooden containers can be repaired by the available labour.

Refrigeration

Cold storage equipment was exhibited by three firms. Included in two of the exhibits were models of hydrocooling plants, one where the crates or nets are immersed in water chilled to 35° F and another in which the chilled water is sprayed over the produce as it moves through the spray chest. Hydrocooling is designed to remove the field heat from the produce quickly and reduce the amount of deterioration, enabling quality produce to be available to the consumer.

The only grader on show was imported, with outputs of up to 2 tons of tomatoes per hour and slightly less of apples and pears. The demand for quality will undoubtedly increase the number of these machines in use on horticultural holdings.

Some Aspects of Agricultural Research

SIR J. SCOTT-WATSON, C.B.E., M.C., LL.D., D.Sc.

THE latest Report of the Agricultural Research Council, like its predecessor, contains articles reviewing progress in a number of particular fields, and these have been reprinted in a booklet* of some eighty pages.

The first of the articles, on foot and mouth disease, begins with a reference to the Report of the Gowers Committee of 1954. This gave full support to our slaughter policy, but made some suggestions for improving the procedures.

Unfortunately this policy is impracticable by our neighbours on the Continent. All that they can do is carry out mass vaccination in areas where the disease threatens to get out of hand. Vaccination on the Continent has been of great benefit to British stock owners, since many of our outbreaks of foot and mouth disease are caused by infection carried over by migrating birds. Effective vaccination is not easy, because there are various strains of the virus, each requiring the use of a specific vaccine. It has been the major task of our Pirbright research station to produce specific vaccines for all known types. This work must go on because new strains of the virus appear from time to time.

The aims of the apple grower as set out in another article are to increase the proportion of top-grade fruit, to get heavier and more regular crops, to produce a range of varieties which will supply our markets over a long season, and to improve methods of storage.

Eight different institutes are at work with these objectives in mind, but only one of them (Wye College) has so far given serious attention to the economics of the industry. The joint committee of the Research and Improvement Councils has urged more work in this field.

The cider factory has for too long been the dumping ground for cull apples of the dessert and cooking varieties; if the beverage is to become more popular it must be produced from special types of fruit.

Several aspects of research involving cattle are reported. It may be thought that the blood grouping of domesticated animals is of academic rather than practical interest, but the study of the subject is pointing to some interesting possibilities. Fowls of certain blood groups seem to lay more eggs than those of other groups. Again, the blood group of a calf may serve as a check on its recorded pedigree. There is a growing demand from research workers for pairs of identical (or one-egg) twins, and blood grouping can, in many cases, determine whether a particular pair are in fact identical. Veterinarians would be encouraged to carry out blood transfusion, in case of severe bleeding or illness, if they could be sure of finding a donor of the same blood type as the patient.

Metabolic disorders appear to be causing increasing trouble to owners of both cattle and sheep.

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* *Some Aspects of Agricultural Research*, No. 2. H.M.S.O. 3*s*. 6*d*. (by post 3*s*. 11*d*.).

Milk fever results from a sudden and excessive drain of the blood calcium. The main precaution is to "steam up" the cow before calving, so that she may be better able to meet the drain. American workers report good results from a heavy dosage with vitamin D (10–30 million units daily), during the week or two preceding the expected date of calving.

Grass staggers (hypomagnesaemia) most frequently occurs in cows a week or two after turning out to grass. The condition is associated with a marked fall in the amount of magnesia in the blood. There are wide differences in susceptibility between one cow and another. Understanding is still incomplete, but it is certain that the application of magnesium salts to the pasture, and the mixing of magnesia with the concentrate ration, give a good measure of protection.

Acetonaemia (ketosis) is a less clearly defined condition. It usually occurs when the cow is approaching her peak yield. The principal sources of "ketone bodies" are fatty acids, and it is logical to suppose that the risk of the condition depends on the extent to which the cow is compelled to use up her body fat in making her milk. There have been good reports about the value of cortisone and hydrocortisone acetate. These drugs promote the utilization of the starch provided in the ration, and help to make it unnecessary for the cow to fall back on her store of body fat. Pregnancy toxaemia (twin-lamb disease) in ewes would seem to be essentially the same condition as acetonaemia in cattle. It is relatively common in ewes carrying twins or triplets. The risk can be kept low if the ewes are kept rather lean during the early stages of pregnancy, and fed more and more liberally as lambing time draws near.

Quality in milk is discussed in its several aspects—bacteriological quality in relation to hygiene in the dairy; compositional quality, including the effects of different treatments on nutritional values.

The remaining three articles are of real merit, but are of interest to scientists rather than to farmers. One on biological genetics and plant breeding deals with the techniques of building up improved strains of crop plants and touches, among other aspects, on the nature of hybrid vigour. The second deals with the assessment of crop losses caused by diseases and pests; such assessment is of obvious importance in planning the deployment of scientific manpower. The last is on the use of growth cabinets, temperature-controlled rooms, glasshouses and phytotrons for the measurement of the effect of temperature, light, soil moisture and other environmental factors on the behaviour and growth of crop plants.

Cash Prizes for Humane Traps

THE Humane Traps Monetary Awards Panel is now ready to consider applications for awards from inventors whose original designs have led to the development of humane traps. Applications for awards should be made on a form obtainable from the Secretary, Humane Traps Monetary Awards Panel, Ministry of Agriculture, Government Buildings, Block B, Hook Rise, Tolworth, Surbiton, Surrey.

The Panel will consider applications from inventors whose traps are already on sale, and from those who are in process of developing new designs or improvements.

Woods and Water

J. D. U. WARD
Minehead, Somerset

BETWEEN narrow, high-banked lanes we drove uphill through drizzle into clouds. At the rendezvous (it was a forest meeting to see the plantations surrounding some reservoirs) our host forester smiled: "Good weather for water catchment"!

How the Suntown Corporation itself had come to be "in" forestry was the usual story of reservoir-forestry association. Water was needed, so land suitable for catchment and reservoir construction (where small dams would make considerable lakes) was bought. Farms were closed, and people and cattle moved—in the interests of hygiene. Then came the question of other possible uses for the catchment land. The answer, as so often, was forestry or timber-growing.

Thus timber was a by-product. But the Corporation wanted it to pay. Silently I reflected that on many private estates also, especially those nearer London, timber was a by-product—or at least took second place to shooting and hunting—and was usually not required to pay.

Many of the problems soon appeared to be substantially the same. "What ought we to plant here, after we've clear-felled?" "Why not try sycamore?" asked a voice—only to be answered with "We've grey squirrels. They'd soon ruin any sycamore." One compartment included a plot of Weymouth pine (named after Lord Weymouth, who planted it largely at Longleat more than 200 years ago), and this excited interest because the species has for many years been a rarity in British forestry. A rust (*Cronartium ribicolum*) is so damaging to the Weymouth pine that the tree is no longer in the normal repertory of the practical forester. This rust has an alternate host on species of the genus *Ribes*—most commonly flowering currants and black currants. In that dripping plantation, under the pines (so likely to be doomed whatever was done), we discussed the need to remove all currant bushes that might be anywhere near, in the hope of saving the Weymouth plot from rust.

I remembered how, similarly, the European silver fir had nearly been knocked out of British forestry by minute insect pests (*Adelges*), a loss which was more easily borne because the very similar American silver fir is tougher and faster growing. But the European silver fir is recalled with sentimental regret, since on many estates and in many counties it used to provide "our tallest tree"—usually between 120 and 150 feet. I have myself, within the last twenty years, had Savernake's tallest tree, an old silver fir of about 140 feet, pointed out to me, even from a distance of five miles.

When Weymouth pine and *Cronartium* had been exhausted we started on ash. Would the 40-year-old ash in this mixed plantation respond if given more room? Ash inevitably led to talk of sports quality (ash for hockey sticks, racquets and skis), and tool handles; and then ash for bus bodies and fire-brigade ladders—a little nostalgically, for there were murmurs of the sad effects of aluminium and various alloys on the ash market. Then we passed

to the contemporary demand for whitewood furniture: ash and again sycamore.

So a kind of changing picture emerged, altering like a kaleidoscope. The picture showed the constitution of forest plantations being affected now by the mischievous greed of squirrels for juicy bark, now by a rust or fungus or by a tiny insect, now by the increasing use of light metals or by modern furniture fashions, and now by those introduced American squirrels again. In fact, that is not nearly complicated enough. Some trees which rank—from the foresters' point of view—as recent introductions are now setting viable seed so much more efficiently than many others that it is easy to imagine whole plantations gradually being transformed by natural regeneration; for example, by seed from the beautiful hemlock-spruce, which has been planted in quantity only since 1945. Older trees are now proving themselves to be very successful "natural regenerators".

When sandwiches and flasks came out to dominate our meeting for a time, tongues wagged yet more freely. We learned that 75 per cent of the reservoir woodlands' profits came from selling Christmas trees—and a visiting head forester told how sheep could be used to weed this crop. They would not touch the trees, but they trimmed the grass and other weeds between them . . . "No, not horses or cattle because when they lay down, that finished the small trees, whereas the trees would survive the weight of weary sheep". The idea had been developed almost by accident, or at least from accidental observation.

A serious-minded man could cavil at foresters concerning themselves with growing Christmas trees, but on very many estates it is in fact these under-ten-years-old trifles which provide the financial sinews for the longer-term and more important forestry, even for growing oak. (That is, perhaps, another aspect of the kaleidoscope.)

In the afternoon there were more plantations to be seen and discussed, especially Japanese larch, not a universal favourite. "It's useless to grow on Jap in the hope of selling *that* stuff for boatskins!" In one very young plantation just ready for weeding there was a great spread of colour; the abundant rosebay willow herb was in bloom to demonstrate the beauty of weeds. But there is one word I did not hear all that day—amenity. Good foresters, though not necessarily blind to beauty, are seldom amenity-minded.

Farming Cameo: Series 2

32. East Merionethshire

J. G. GRIFFITHS, B.Sc., N.D.D.
District Advisory Officer

THE region defined as East Merionethshire consists of the rural districts of Penllyn and Edeyrnion. Famous for its scenic beauty, it is very popular with tourists from all parts of the country. In Penllyn the majestic Aran Benllyn rises to 2,901 feet in the west and we have the rugged Arenig Mountain in the north. Bala, the main town, is on the shores of Llyn Tegid (Bala Lake), which is the largest natural lake in Wales. Practically the whole of Penllyn has been included in the Snowdonia National Park. Leaving Bala, the River Dee winds its way through the beautiful Vale of Edeyrnion on to the market town of Corwen, and then flows eastwards, leaving the county below the village of Glyndyfrdwy, a few miles from Llangollen. The rural district of Edeyrnion is flanked along its south-eastern side by the Berwyn Mountains, and in the north west the River Clwyd serves as a natural boundary for several miles.

The soils of the area are formed mainly from glacial drift material derived from non-calcareous Silurian or Ordovician shales and grits. In the uplands, continuous heavy leaching has resulted in the formation of peaty soils very deficient in lime and phosphate. The main areas of freely draining cultivated soils on the lower slopes fall into the category of Brown Earths, and with them can be included the well-drained alluvial soils in the valley bottoms.

Rainfall varies considerably, ranging from nearly 90 inches in the mountains of the west to approximately 40 inches in the lower reaches of the Dee valley.

The area is one of small farms depending on family labour, and only a few holdings employ two or more workers. Most of the farmers are now owner-occupiers; in fact there are now only three fairly large estates remaining, one of which is the Glanllyn Estate, Llanuwchllyn, managed by the Welsh Land Sub-Commission.

Practically the whole of the farming community is Welsh speaking, and all lectures, demonstrations and advisory events have to be conducted in Welsh.

Before the second world war the area was devoted chiefly to the rearing of store cattle and sheep. Today, however, although stock rearing continues to be important, milk selling and fat lamb production have become major enterprises, particularly on the better farms around Corwen.

There are now nearly 500 milk producers in Penllyn and Edeyrnion, but only a small proportion of them can be called specialized dairy farmers. In the uplands, store cattle rearing and milk production are of equal importance. Herds are small and there is a tendency to put more emphasis on summer milk. On the better farms, especially those under 60 acres, milk production is the main enterprise and the dairy breeds predominate. There

is no cash cropping and subsidiary enterprises such as pigs and poultry are only of minor importance.

It has been said that the Welsh farmer is more interested in livestock than in arable cropping. This is particularly true of the East Merionethshire farmer, who is justly proud of the native breeds of sheep and cattle. The hardy Welsh Mountain ewe thrives on the tough hill farms, and is also in great demand with lowland farmers for crossing with the heavy breeds, mainly Suffolk, for fat lamb production. The dual-purpose Welsh Black Cattle are very popular over most of Penllyn, and are ideally suited to the local conditions. In the upper Dee valley and Edeyrnion the Shorthorn has been the main breed, but during recent years dairy breeds, particularly Friesian types, have increased.

On the upland farms, conservation of fodder is always a problem. Hay and unthreshed oats form the basis of the winter feed and, unfortunately, it is only during a wet summer that silage is made. Feeding of the hill flock in winter is always a controversial topic and there are many aspects to the problem. Ewe lambs are wintered away from home at considerable cost. Home wintering in slatted floor buildings has been tried successfully on a few farms, but the practice has not become widespread.

The semi-lowland farms of Edeyrnion present a slightly different picture, for here arable cropping for stockfeeding assumes greater importance. The usual rotation is oats, followed by a green crop—mainly kale—and seeding under corn in the third year. The leys are down for six to seven years. Smaller dairy farms follow the grass–kale–reseed sequence of cropping. The sheep enterprise is concerned with fat lamb production, and farms which do not carry a ewe flock take in ewe lambs for wintering from the neighbouring hill farms.

Practically all occupiers who are entitled to do so have taken advantage of the Hill Farming and Livestock Rearing Schemes to make improvements. Work on farmhouses and buildings, the erection of fences and land reclamation have been going on steadily since the passing of the Hill Farming Act in 1946. An enormous acreage of hill land has been reseeded during the last ten years. The cost of this work has been high in terms of human labour, but with the help of Ministry grants the effort has been worth while.

Any rural area depending entirely on the sale of livestock and livestock products is faced with the problem of marketing, and East Merioneth is no exception. The absence of an urban population means that the producer has to find a customer outside the county. Local co-operative organizations have been formed which now deal very competently with the marketing of milk, store cattle, ewes and fat lambs.

The farmers of Penllyn and Edeyrnion are hard working and, in many cases, striving to make a living under difficult conditions. Their kind hospitality is remarkable and they are very appreciative of any assistance their Advisory Officer is able to give. Problems are varied, as one would expect in an area ranging from the extensive hill farm to the small intensive holding concentrating on dairying, but without variety life would become very monotonous.

At the Farmers' Club

The Future of the Poultry Industry

"THE changes I have seen in the years I have been active in the poultry industry are quite fantastic", declared Mr. Cyril Thornber, when he began his talk on the industry's future at the Farmers' Club on 9th November. He confessed himself somewhat apprehensive about predicting future changes for, he said, the industry moves very quickly, adopting new ideas and putting them into practice with great rapidity. Future developments must also be governed by current economic conditions. Mr. Thornber went on to outline various trends discernible in egg production, and then touched briefly on the future of the broiler industry.

Egg production, aided by government subsidy, has increased steadily since the war until now there is some over-production, at which stage the question of subsidies "becomes very vexed indeed". Mr. Thornber visualized a gradual but complete removal of the egg production subsidy, adding that he would not like to suggest an actual date for this. "Those who advocate its immediate withdrawal are perhaps a little bit too optimistic about the rate at which the industry can increase its own efficiency."

Efforts to improve efficiency involve the difficult problem of balancing the public's demand for eggs and the industry's ability to produce that number, consistently, each week throughout the year. Improved leadership and guidance from the Egg Marketing Board will be needed.

The last ten years have seen a major revolution in the approach to poultry breeding in this country. Poultry lend themselves wonderfully well to the application of modern genetic ideas, having the advantage of a generation every 6 months. This rapid multiplication makes it relatively easy for the poultry breeder to measure his progress, and enables him to keep much larger families and numbers than is possible in any other branch of livestock farming. As a result, the large majority of chickens produced each year for commercial egg production are from scientifically designed breeding programmes. Hybridization has been accepted very quickly.

"The application of progeny testing as a means of evaluating pure strains and cross will, in my opinion," said Mr. Thornber, "increase to a much greater extent in the years to come." Techniques that short-circuit progeny testing will also be increasingly sought. Blood typing, for instance, may help by indicating the superior birds within lines, and thus enable the breeder to improve more quickly the chickens he sells. Mr. Thornber forecast greater emphasis on the physiological approaches to selection, and wondered whether electrophoresis is likely to give useful indication of superior stock.

Statistics, already an invaluable tool in poultry breeding selection programmes, will become increasingly important, and as more electronic computers become available, new assessments will become possible. Up to now, the poultry breeder has been applying selection techniques discovered by the fundamental research workers. Increasing competition could well lead more and more breeding organizations to undertake fundamental research

themselves. "There is a woeful insufficiency of money being devoted to fundamental research in poultry." The present shortage of skilled scientific workers will eventually solve itself, though not quickly enough. Mr. Thornber welcomed the signs of closer liaison between government and university research centres and the poultry breeding industry. The geneticists controlling the production of commercial chickens have an enormous responsibility, he said, for in 4 generations the increase from basic strains to commercial chickens is in the region of 38,000 to 1, and breeding errors could involve the industry in great losses.

Knowledge about the improvements in performance and efficiency obtainable when chickens are kept in controlled environments continues to grow. Mr. Thornber predicted that an ever-increasing number of laying birds will live their whole lives in artificial light. Windowless houses, controlled ventilation and lighting systems, scientifically designed and carefully insulated houses and even artificial heating are being used in attempts to provide the ideal environment for maximum performance. This trend will continue, but there is danger in trying to go faster than present knowledge justifies, and more research is needed.

Deep litter is being superseded by slatted or wire floors, to increase population density, and the battery system may well give place to systems of very large cages. Provision of food and water, removal of droppings, and egg collection are expected to become more and more mechanized. Increased density of birds will make greater emphasis on hygiene essential. Mr. Thornber predicted that the slaughter policy for fowl pest control will have to be abandoned in favour of vaccination, though this will bring political problems. He also criticized the Poultry Stock Improvement Scheme, considering that the progeny testing stations contribute very little to the efficiency of the industry.

Mr. Thornber hoped for a lead on egg quality from the Egg Marketing Board. Soon over 90 per cent of eggs sold will be packed in cartons, and the housewife will be asking for a specific brand. The trend towards fewer compounders of poultry foods will continue, and lead to better rations and better performance.

He also expected the phenomenal expansion of the broiler industry to continue. There is no evidence that maximum efficiency has been achieved, and eventually we may be producing poultry meat more efficiently than the Americans, but the very small profit margins will exclude all but the largest organizations.. Present production is around 100 million broilers a year.

SYLVIA LAVERTON

On 14th December, M. André Voisin will address the Club on "*The Importance of the Time Factor in Grazing*".

Agricultural Statistics England and Wales

JUNE, 1959, AGRICULTURAL RETURNS (FINAL)

CROPS AND GRASS

(*thousand acres*)

DESCRIPTION	1958	1959
Wheat	2,115	1,843
Barley	2,526	2,803
Oats	1,247	1,113
Mixed corn, for threshing	272	224
Rye, for threshing	22	13
Total corn	**6,182**	**5,995**
Beans, for stockfeeding	88	78
Peas, for stockfeeding	15	10
Potatoes, first earlies	85	87
Potatoes, main crop and second earlies	491	482
Total potatoes	**575**	**570**
Turnips, swedes and fodder beet for stockfeeding	246	231
Sugar beet (for sugar)	423	416
Mangolds	142	128
Rape (or cole)	104	85
Kale, for stockfeeding	354	324
Cabbage, savoys and kohlrabi for stockfeeding		26
Vetches or tares	19	12
Mustard, for seed, fodder or ploughing in	35	32
Hops	21	20
Orchards with crops, fallow or grass below the trees	235	232
Orchards with small fruit below the trees	8	8
Small fruit, not under orchard trees	31	31
Vegetables (other than potatoes) for human consumption and grown primarily for sale, hardy nursery stock, flowers and crops under glass	440	414
Fruit and vegetables, not grown primarily for sale	7	7
All other crops	43	35
Bare fallow	246	356
Total of crops and fallow (tillage)	**9,216**	**9,012**
Lucerne	96	85
Temporary grass (including clover and sainfoin)		
for mowing	2,446	2,456
for grazing	1,732	1,954
Total	**4,178**	**4,410**
TOTAL ARABLE LAND	**13,490**	**13,506**
Permanent grass for mowing	3,087	2,897
Permanent grass for grazing	7,930	8,070
Total	**11,017**	**10,966**
TOTAL ACREAGE OF CROPS AND GRASS excluding Rough Grazings	**24,506**	**24,472**
Rough grazing—sole right	3,573	3,545
Common rough grazings	1,485	1,490
Total rough grazing	**5,058**	**5,035**

*CLOVER, SAINFOIN AND OTHER TEMPORARY GRASSES**

(includes Lucerne at June, 1959)

(*thousand acres*)

DESCRIPTION	1958	1959
Sown in current year without a nurse or cover crop	259	259
Sown in previous year as one-year ley to be ploughed for cropping next year	561	581
Sown in previous year as a ley to be left down longer than one year	856	875
Sown 2-6 years ago	2,501	2,136
Sown 7 or more years ago		642
Total	**4,178**	**4,494**

* Raised figures to cover the (about) 12 per cent of the occupiers who did not supply information.

SMALL FRUIT

(*thousand acres*)

DESCRIPTION	1958	1959
Strawberries	16·7	16·1
Raspberries	2·5	2·5
Currants, black	12·3	12·9
Currants, red and white	0·7	0·7
Gooseberries	5·4	5·4
Loganberries and cultivated blackberries	1·2	1·4
Total	**38·9**	**39·0**

VEGETABLES FOR HUMAN CONSUMPTION, HARDY NURSERY STOCK, FLOWERS AND CROPS UNDER GLASS

(*thousand acres*)

DESCRIPTION	1958	1959
Vegetables for human consumption (excluding potatoes) grown in the open		
Brussels sprouts	47·4	48·2
Remaining spring cabbage (planted in previous year)	9·4	6·8
Summer cabbage	9·0	8·0
Autumn cabbage	5·2	5·3
Winter cabbage	12·6	13·8
Autumn savoys	2·3	2·3
Winter savoys	6·9	7·2
Kale and sprouting broccoli	2·7	3·0
Winter cauliflower or broccoli (heading):		
Remaining from previous year's plantings	3·3	2·3
Planted in the current year	10·3	10·4
Summer and autumn cauliflower:		
Early summer sown under glass and planted in the open	6·9	7·0
Late summer and autumn (open sown)	10·0	9·8
Carrots, earlies (grown for bunching only)	2·1	2·1
Carrots, main crop	30·8	28·6
Parsnips	4·1	3·7
Turnips and swedes	4·7	4·6
Beetroot	8·9	7·5
Onions, grown for salad	1·5	1·4
Onions, for harvesting dry	3·1	1·9
Beans, broad	11·3	9·5
Beans, runner	10·2	9·6

DESCRIPTION	1958	1959
Beans, dwarf or french	3·1	3·9
Peas, green for market	34·4	28·9
Peas, green for canning or quick freezing	55·5	62·4
Peas, for harvesting dry:		
Marrowfats	60·6	47·6
Blues	11·8	7·8
Asparagus	1·4	1·4
Celery	5·5	5·5
Lettuce	7·8	8·1
Rhubarb	5·1	5·2
Tomatoes (growing in the open)	0·6	0·4
Other vegetables and mixed areas	17·4	16·1
Total	**405·8**	**380·1**
Hardy nursery stock:		
Fruit trees, fruit bushes and other fruit stock	3·8	3·7
Ornamental trees and shrubs	5·5	5·4
Other nursery stock, (herbaceous plants, alpines, etc.)	3·7	3·7
Bulbs and flowers in the open:		
Bulbs grown for flowers:		
Daffodils (Narcissi)	4·1	3·9
Tulips	1·8	1·8
Other bulb flowers	0·8	0·9
Bulbs grown for sale as bulbs:		
Daffodils (Narcissi)	1·7	2·3
Tulips	1·7	1·8
Other bulbs	0·2	0·2
Other flowers, not under glass	6·8	6·5
Total	**17·1**	**17·4**
All crops grown under glass	**4·4**	**4·2**

LIVESTOCK

(*thousands*)

DESCRIPTION		1958	1959
Cows and heifers in milk:			
For producing milk or calves for the dairy herd		2,171	2,137
Mainly for rearing calves for beef		428	427
Cows in calf but not in milk:			
Intended for producing milk or calves for the dairy herd		353	356
Intended mainly for rearing calves for beef		86	84
Heifers in calf (first calf)		600	635
Bulls being used for service		56	54
Bulls (including bull calves) being reared for service		21	23
Other cattle:			
2 years old and over	Male (Steers)	465	481
	Female	463	422
	Total	**928**	**903**
1 year old and under 2	Male (Steers)	604	745
	Female	1,022	1,042
	Total	**1,626**	**1,787**
Under 1 year old (excluding bull calves being reared for service)	Male	777	878
	Female	1,111	1,152
	Total	**1,888**	**2,029**
TOTAL CATTLE AND CALVES		**8,157**	**8,435**
Calvings which occurred during the three months preceding date of census:			
Heifers that calved for the first time during March, April and May		160	161
All other cows that calved during March, April and May		597	605
TOTAL CALVINGS		**757**	**766**

DESCRIPTION	1958	1959
Sheep one year old and over:		
Ewes kept for breeding	6,589	6,852
Two-tooth ewes (shearling ewes or gimmers)	1,605	1,770
Rams kept for service	191	197
Draft and cast ewes	255	305
Wethers and other sheep	524	696
Total one year old and over	**9,165**	**9,820**
Sheep and lambs under 1 year old	8,031	8,396
TOTAL SHEEP AND LAMBS	**17,196**	**18,217**
Sows in pig	354	312
Gilts in pig	117	87
Other sows kept for breeding	194	161
Total sows for breeding	**665**	**561**
Barren sows for fattening	21	19
Boars being used for service	40	34
All other pigs:		
5 months old and over	874	841
2–5 months old	2,230	2,096
Under 2 months old	1,370	1,157
Total all other pigs	**4,474**	**4,093**
TOTAL PIGS	**5,199**	**4,707**
Fowls 6 months old and over	32,507	35,053
Fowls under 6 months old:		
Male	6,832	5,951
Female	31,813	32,785
Sex not known	4,154	8,209
Total fowls under 6 months old	**42,799**	**46,945**
TOTAL FOWLS	**75,306**	**81,998**
Ducks of all ages	1,021	996
Geese of all ages	363	329
Turkeys of all ages	1,795	2,353
TOTAL POULTRY	**78,485**	**85,675**

LABOUR

(*thousands*)

DESCRIPTION	1958	1959
Regular whole-time workers:		
Male, 65 years old and over	17·5	16·2
„ 20 years old and under 65	319·5	313·2
„ 18 years old and under 20	28·3	27·2
„ under 18 years old	34·1	36·5
Total male	**399·5**	**393·1**
Women and girls	32·9	31·8
Total male and female	**432·4**	**424·9**
Regular part-time workers:		
Male, 20 years old and over	39·9	38·6
„ under 20 years old	4·8	4·8
Total male	**44·7**	**43·4**
Women and girls	28·7	28·6
Total male and female	**73·4**	**72·0**

DESCRIPTION	1958	1959
Seasonal and temporary workers:		
Male, 20 years old and over	43·0	43·2
„ under 20 years old	3·9	4·1
Total male	46·9	47·3
Women and girls	37·9	40·4
Total male and female	84·9	87·7
TOTAL MALE WORKERS	491·1	483·8
TOTAL FEMALE WORKERS	99·5	100·8
TOTAL WORKERS	590·6	584·5

THE MINISTRY'S PUBLICATIONS

Since the list published in the November 1960 number of AGRICULTURE (p. 428) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops or through any bookseller at the price quoted.

Agricultural Statistics 1958–59 England and Wales. Agricultural Censuses and Production for 1958–59, together with Prices and Index Numbers for 1958 and 1958–59 (*New*) 8*s.* 6*d.* (by post 9*s.* 1*d.*)

LEAFLETS

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In Brief

ABORTION IN SHEEP: ACCURATE DIAGNOSIS ESSENTIAL

Abortion is fast becoming a major source of loss in sheep flocks. Contrary to the belief of many flock-masters, most outbreaks are due not to accidents and fright, but to infection. It is essential to have the cause investigated so that steps can be taken to control the disease.

Ewes seldom show any outward sign of being affected until just before they abort, and sometimes not even then, but the abortion rate can vary between 10 and 80 per cent. Enzootic abortion of ewes, or "kebbing" as it is called in Scotland and in the northern counties of England, is probably now the most widely distributed type of abortion. Other, but less common, infections are due either to the germ *Vibrio fetus,* a cause also of infertility in cattle, or to another germ, *Salmonella abortus ovis.* Very recently, research work in Yorkshire has revealed the possibility of ovine abortion being caused by another kind of organism, but this has not so far been proved.

Enzootic abortion is caused by a virus which multiplies in the membranes surrounding the lamb. This leads either to premature expulsion of a dead lamb or, in some cases, to the birth at near full term of a live but weak lamb which seldom survives. The abortion may take place at any time during the final six weeks of pregnancy, but generally it occurs during the last fortnight.

The virus cannot live for very long outside the body and it seems that the infection is spread only at the time of abortion, when it is present in profusion in the membranes and discharges. The chance of spread is greatest, therefore, in crowded lambing pens. The virus enters the healthy ewes almost certainly by the mouth, and remains dormant until the next pregnancy.

The disease does not seem to have very much effect upon the general health of the mother herself, and it is rare for animals to abort more than once. Therefore a ewe which aborts one year is likely to enjoy a normal pregnancy following the next mating. When the cause of the abortion has been established by veterinary inquiry and laboratory examination, the ewes at risk can be vaccinated to protect them in the following season. But to give the maximum benefit, the vaccine must be injected both before and after mating. So far no suitable method of curing infectious abortion has yet been devised once an outbreak has started.

Like the virus of enzootic abortion, the germs responsible for abortion in sheep (*Vibrio fetus* and *Salmonella abortus ovis*) enter by the mouth from contaminated ground. In addition, *Vibrio* may be transferred by the ram during service. Once infected with *Vibrio fetus* a ewe can remain so for years; and having aborted once she often becomes a carrier and a source of danger in a healthy flock. Vibrionic abortion may take place early in gestation, but *Salmonella* infection usually does not become apparent before late pregnancy, and then it may result in prolapse of the womb or death of the ewe.

Accurate diagnosis of the cause of abortion in a sheep flock is very important, for it provides the only ground on which control can be made effective. In addition to vaccination in the case of enzootic abortion, care must be taken in all outbreaks to minimize the spread of infection in the flock, and the shepherd may have to face the prospect of a "closed" flock and reduced population for some time as the best means of combating abortion due to *Vibrio fetus* and *Salmonella abortus ovis* infections.

IN BRIEF

T.T. ATTESTED AREAS IN THE IRISH REPUBLIC

Sufficient progress has been made with tuberculin testing of cattle in the counties west of the River Shannon to enable the authorities in the Republic to declare that Donegal, Mayo and Sligo became attested areas on 5th December 1960. Clare, Leitrim, Roscommon and Galway will probably become attested areas soon. These arrangements have been agreed by the United Kingdom Agricultural Departments.

Cattle from herds in these areas of the Republic which have passed three consecutive clear tests and are moved under attested conditions will be regarded as equivalent to United Kingdom attested stock. They will be free to join attested herds in the United Kingdom and will not be subject to isolation and re-test after sixty days.

WEED RESEARCH: A NEW AND IMPORTANT JOURNAL

The development of chemical methods of weed control has been described as one of the most outstanding events in agricultural progress of the twentieth century. Accompanying this development has been a steady increase in the number of scientists and agronomists carrying out research and development work on weed control in general and herbicides in particular. In the U.K. we are fortunate in having absolutely first-rate liaison between all organizations and individuals interested in weed control topics, as a result of the formation of the British Weed Control Council and the goodwill that exists between official research workers and their counterparts in industry. Until recently, however, there has been little effort to provide liaison between research workers in different European countries. Science knows no frontiers, and many of the practical problems associated with the study of weeds and control methods are similar throughout most of Europe. Thus some degree of co-operation can hardly fail to be of benefit.

The first step has now been taken to ensure this co-operation by the formation of the European Research Council. At a meeting in Oxford in April 1960, the Council, which consists of specialists from most European countries, was voted into existence by the delegates to the second meeting of the International Research Group on Weed Control, a temporary organization which the Council succeeds.

One of the first tasks of the Council has been to sponsor an international journal called *Weed Research*, which will bring together papers from all parts of the world, written in English, French or German, and concerned with the science and technology of herbicides and other methods of weed control.

Sufficient funds have now been guaranteed as a result of the very willing collaboration of commercial firms and other interested organizations from many European countries, and the first issue of *Weed Research* is due to be published in March 1961. Subsequent issues will follow at intervals of three months.

The scope of the journal will be wide, because the subject itself touches upon so many branches of applied science and technology. The sole criteria for acceptance will be originality and interest of the work and a high standard of presentation. Subjects will range from studies on the mode of action of herbicides, or their persistence in the soil on the one hand, to the results of field trials studying the relative merits of chemical and cultural methods of weed control in arable or grassland husbandry on the other.

Weed Research will meet a long-felt requirement in this rapidly expanding and technical subject. The lack of suitable journals for publishing the results of much of this specialized research has for many years hindered progress and discouraged authors. The proceedings of specialist conferences have effectively disseminated the interim results of the more applied work, but have not proved

suitable for the detailed reporting of work on a scientific level. As a result, the literature on weed research is now scattered throughout innumerable journals; also, because it has not been easy for the research worker to find a suitable niche for his results, much valuable work has not appeared in print.

Contributions to the new journal will be welcomed from any part of the world and should be sent to the editor, Mr. J. D. Fryer, Agricultural Research Council Weed Research Organization, at Begbroke Hill, Kidlington, Oxford.

J. D. Fryer

STANDARD CHIP BASKETS

British Standard 3268: 1960 specifies the dimensions, materials and construction of a range of chip baskets for horticultural produce such as tomatoes, mushrooms and soft fruits.

It is the latest in a lengthy series covering containers for horticultural produce. Specifications already issued cover a number of containers, mainly of the returnable type. Work is now progressing on non-returnable containers.

Guidance on wicker and veneer containers for packaging generally is given in B.S.113, Packaging Code, Section 17, but the new standard specifies certain details of chip baskets more precisely, and provides for other sizes of chip baskets which are widely used in certain parts of the country.

Copies of the new standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London W.1, price 3*s.* (by post 3*s.* 6*d.* to non-subscribers).

"SPECIAL STOCK" STRAWBERRY PLANTS IN 1961

The scheme for the inspection and certification of "Special Stock" strawberry plants will be operated in 1961, as in previous years, by the Ministry. Only plants from approved parent stocks are eligible; in 1961 the approved stocks will be the following varieties distributed by the Nuclear Stock Association Ltd.:

Cambridge Favourite	SCF 60	Madam Lefebvre	SML 60
Cambridge Prizewinner	SCP 60	Redgauntlet	SR 60
Cambridge Rearguard	SCR 60	Royal Sovereign	SRV 60
Cambridge Vigour	SCV 60	Talisman	ST 60
Huxley	SH 60		

The varieties Huxley SH 60 and Cambridge Favourite SCF 60, which are not completely virus-free, must be grown at least one mile from other varieties for "Special Stock" certification but can be grown near each other provided the isolation rules are observed and they are otherwise eligible.

Cambridge Favourite SCF 60 is included in the 1961 "Special Stock" strawberry certification scheme for the first time, and will not be the subject of an "A" scheme in 1961. "Special Stock" of this variety entered for certification in 1961 is confined to those stocks of the Nuclear Stock Association Ltd. which obtained an Elite certificate in 1960; no other stocks will be considered.

Applications will not normally be accepted for less than 500 plants of any one variety.

Application forms and full particulars of the scheme will be forwarded to all 1959 or 1960 entrants. Other growers wishing to enter should apply to the Ministry of Agriculture, Plant Health Branch, Whitehall Place, London S.W.1.

Enquiries regarding supplies of runners of eligible stocks should be addressed to the Nuclear Stock Association Ltd., Agriculture House, 25-31 Knightsbridge, London S.W.1.

IN BRIEF

R.A.S.E. RESEARCH MEDAL

Every year the Royal Agricultural Society of England offers a medal, together with an award of one hundred guineas, for research work of outstanding merit carried out in the United Kingdom which has proved, or is likely to prove, of benefit to agriculture.

Recommendations for this award can be made by the Heads of University Departments, Research Stations and Institutes and other research organizations. No direct application by candidates will be considered.

Recommendations for the next award must be submitted to the Secretary, Royal Agricultural Society of England, 35 Belgrave Square, London S.W.1, not later than 31st January 1961, and be accompanied by nine copies of a brief statement of the candidate's attainments and a list of his publications.

C.L.A. PHOTOGRAPHIC COMPETITION

The Country Landowners' Association, in conjunction with *The Field*, is sponsoring a photographic competition in connection with the 1961 Game Fair at Weston Park, Shifnal, Shropshire, on 21st–22nd July. The prizewinning photographs and other selected entries will be displayed at this next Game Fair.

The subject of the competition is wild life and field sports in the United Kingdom in relation to the Game Fair. There are four classes of entries; three for black and white prints, and one for colour prints as follows:

Wild Life (game birds, fish and animal studies), including all forms of game birds, wildfowl, trout, salmon, falcons and gun dogs.
Shooting (excluding clay pigeon shooting).
Freshwater fishing for salmon and trout.
Colour prints of any of the above subjects.

There will be a prize of 10 guineas for the winning photographs in each of the four classes, and a special prize of 25 guineas for the best photograph submitted for the competition.

Further details, and entry forms, may be obtained from the Country Landowners' Association, 24 St. James's Street, London S.W.1.

FARMING AND COUNTRY PLANNING

A course of eight evening lectures on Farming and Country Planning has been organized by the Association of Agriculture in collaboration with the Extra-Mural Department of London University.

It will be held on Wednesdays at 6.30 p.m. from 18th January to 8th March 1961 at the London School of Hygiene and Tropical Medicine, Keppel Street, London W.C.1. Fees will be 15*s.* for the whole course, or 2*s.* 6*d.* for individual lectures.

A distinguished team of lecturers will cover such subjects as The Ownership of Farmland, Recent Changes in Rural Land Use, The Effect of Planning on the Farmer, and Green Belts and Their Significance.

The lectures should interest not only farmers and growers, but also, for example, town planners, civil servants, geographers and surveyors.

Book Reviews

The Handling of Chromosomes. C. D. DARLINGTON and L. F. LA COUR. Allen and Unwin. 30*s*.

Genetics is gradually but much too slowly becoming established as an essential part of biological training. Practical work such as the observation of genetical ratios on maize cobs is a useful way of establishing an understanding of genetics. The development of genetics has been closely associated with that of cytology, and practical cytology is equally useful. The preparation of slides showing the number, morphology and behaviour of chromosomes is not difficult if the material and techniques are selected with care.

Since the publication in 1942 of the first edition, *The Handling of Chromosomes* has become an essential handbook for all laboratories in which cytology is taught and investigated. The detailed directions therein are as helpful to students and teachers as the technical information is for research. This new and larger edition (the third) has been revised to include more recent developments.

The opening chapter is a consideration of the origin, scope and purpose of chromosome work. Cytology is frequently considered to be the study of chromosomes by means of staining. It is emphasized, however, that the ultimate aim of chromosome studies is the control of reproduction, heredity and development "through the agency of chromosomes". This requires a wide range of techniques for handling chromosomes, of which microscopic examination is only one. Nevertheless, fixation followed by staining is still the main content of the book. A clear description of equipment and materials and the purposes of each stage of the treatments is followed by complete schedules of treatments for staining the chromosomes of plants, animals and micro-organisms.

Other techniques, such as the breakage of chromosomes by irradiation or chemical treatment and the production of polyploids, are introduced sufficiently to stimulate interest or to direct investigation. Plant breeders can benefit from such techniques as the storage of pollen and the observation of fertilization. There is also a calendar of useful cytological material, both plant and animal, which is available in each month. A useful chapter on methods of observation, interpretation and description of results, and a series of excellent plates, make the book an invaluable aid to all who wish to know and practise cytology.

One of the additions is a chapter on autoradiography. The labelling of chromosomes or other cellular constituents by radio-isotopes such as P_{32} is a recent advance which is facilitating a more direct understanding of the association between cytology and genetics. As with staining procedures in the earlier editions, this book is showing the way by presenting the simpler techniques.

Finally, the great increase in the number of references makes this small book into a mine of information. I hope that it will stimulate schools and colleges to consider practising cytology as well as genetics. It deserves a wide circulation and should continue to activate an interest in practical cytology which, if a guide book of this quality is used, is not as difficult as is frequently thought.

J.K.J.

Slaughterhouses. PAUL SEIGHART and J. B. WHALLEY. Sweet and Maxwell. 50*s*.

The history of regulations relating to slaughterhouses and the activities therein extends over many years, with the added complication of the break caused by wartime controls. Over the last few years there has been a spate of legislation which affects directly and indirectly the livelihood and activities of owners and operators of slaughterhouses. Indeed, this legislation must determine the development of the industry as a whole for many years to come.

Frequent references to previous legislation are made in the latest acts and regulations, which makes it difficult for the layman to understand all the implications of the various provisions. There is, therefore, a definite need for a handy resumé of the present legal position, in as simple

language as possible, in which particular aspects can readily be referred to.

This publication meets the need admirably. The salient provisions are crystallized in plain language in chapters dealing with "The Law Relating to Slaughterhouses", "Licensing Procedure and Requirements", "The Slaughter of Animals", "Slaughterhouse Practice", and the "Safety, Health and Welfare of Workers in the Slaughterhouse Industry". The various acts and regulations are detailed in the appendices, together with much other useful information. This book should be available for reference by all concerned in the trade of converting live animals to meat. The one criticism which could be made is that publication has been so long delayed, for time is running short, particularly on many of the provisions of the Slaughterhouses Act 1958.

A.W.A.

Horticultural Pests: Detection and Control. G. FOX WILSON. (New edition, revised by P. Becker.) Crosby Lockwood. 25*s*.

Since the end of the war pest control in agriculture and horticulture has undergone a revolution. Before 1945 the control of a harmful insect involved some knowledge of its life history and habits, its relations with host plants and environment, and the general principles of pest control evolved during the preceding half-century. The measures recommended were generally not very efficient owing to the use of volatile substances or to difficulties of application, and often the most that could be done was to suggest methods of stimulating plant growth so that the effects of pest attack were minimized. The introduction of synthetic chemical insecticides such as DDT and BHC, and later the systemics, rendered obsolete most of the advisory books that were published before 1948 and also many of the principles on which they were based.

The first edition of *Detection and Control of Garden Pests* was written before the new chemical and systemic insecticides were generally available, so there was great need for its revision and modernization. Its value lay in its emphasis on the form of plant injury as the key to the identity of the pest, an approach very convenient for commercial and advisory horticulturists and amateur gardeners. In the new edition Dr. Becker has retained this scheme, and by giving many more details in the table of contents has made it much easier to use. He has brought the nomenclature up to date, a point which will be appreciated by entomologists. He has added to the list of injurious organisms, and amended the recommendations for their control by incorporating new biological information and drawing on a wide experience of the efficacy of the new chemicals. A list of the best-known modern insecticides, with some notes on their uses and limitations, has also been added.

It is interesting to see that in reorganizing the section on chemical control Dr. Becker has omitted the paragraphs dealing with stomach and contact poisons. He could also have omitted those on life histories and feeding habits because these too are no longer regarded as important in the practice of pest control. The many excellent illustrations, both coloured and half-tone, will facilitate the recognition and identification of injuries. The book should prove indispensable to growers and gardeners.

M.M.

Work Study. R. M. CURRIE. Pitman 22*s*. 6*d*.

In the last decade, the application of work study to agriculture has produced a considerable and varied literature. Consequently, interested agriculturists find little difficulty in obtaining information in their own professional terms on the basic principles and techniques of the subject, and on its use in advisory or investigational work on the farm. Most readers, no doubt, are satisfied with such a general understanding of this new aid, but some may wish to follow the subject further. Such potential specialists cannot do better than read this book.

Mr. Currie, who is president of the Institute of Work Study as well as head of the Central Work Study Department of I.C.I., is a recognized authority on this subject. He is, indeed, one of the founding fathers of work study in this country. Fortunately he can teach it as well as he can practise and organize it. The result is a model text-book, clear in style,

systematic in approach, and comprehensive in treatment. Written mainly for engineering students whose curricula reflect the growing importance of work study in industry, it will, however, be appreciated by all those interested in the subject.

Mr. Currie's introductory chapters waste little energy on refuting that curious folk-lore of fallacies and prejudices that has developed around work study. The approach is more positive. His opening chapters tell the reader how work study arose, what it can do and why the confidence of the studied is essential if it is to be effective. The rest of the book is a detailed and well-illustrated exposition of the two related parts of work study—"method study", which is the procedure for analysing and improving existing or proposed methods of work, and "work measurement", which is used to determine the time required for the performance of specified jobs under specified circumstances. He concludes with a substantial chapter on work study as a service to management.

This is not a book for the general agricultural reader. It is a technical work—much of it highly so—for technical readers; all its arguments and examples assume an industrial background; and there is not a single reference in it to farming. But the techniques it describes are as valuable on the farm as in the factory, and they have seldom been described as lucidly and effectively as in these pages. Anybody seriously concerned with work study in agriculture should be familiar with this book.

N.H.

The Countrywoman's Year. Edited by THE MARCHIONESS OF ANGLESEY. Michael Joseph. 21*s.*

This is indeed a book for all seasons, and dull will be the woman who will not find in its infinite variety something to appeal to her own particular taste for the creative. Although compiled by a countrywoman for country women, few townswomen will wish to be without it.

The editor roves from the lanes, the woods and the hedgerows, through the orchard and the garden, into the kitchen, the larder, the cellar and the workroom. She wanders into the village in search of receipts for mouthwatering dishes, home-made wines, floor polishes and face creams, instructions for traditional crafts and descriptions of local festivals.

She tells her readers how to make turtle soup and parsley bread sauce, how to clean a badly discoloured bath, make a patchwork quilt, look after indoor plants, how to make up for amateur theatricals, and a host of other things. Prospective beekeepers can learn that they may buy a beginner's outfit, complete with hive, veil, smoker, five-comb nucleus and simple guide, all for £14. Having harvested the honey they will then discover that in addition just to eating it for tea, they can use it to make various kinds of mead, butterscotch, hand cream, and furniture polish!

The sections on local festivals are fascinating and full of holiday spirit. Who would not want to be at Preston in Lancashire on Easter Monday for the egg rolling, at Birdlip in Gloucestershire on Whit Monday for the cheese rolling, at Padstow in Cornwall on May Day to see the Padstow Horse, or at Abbots Bromley in Staffordshire on Wakes Monday for the Horn Dance?

This book is the perfect Christmas present for a woman, and whether she lives in a cottage or a castle, a flat or a suburban villa it will provide her with a long list of new year resolutions. Wallpapering, upholstery, Dorset feather stitchery, how to choose between edible and inedible fungi—they all sound so simple and foolproof. One would like to try everything, but where, oh where, is the time?

M.G.

A Survey among Grassland Farmers: Comprehensive Report by D. SHEPPARD, with chart book. Central Office of Information. 47*s.* (A shorter version is also available, price 12*s.* 6*d.*)

The communication of ideas and information to—and among—farmers has been studied much less in this country than (for example) in the U.S.A. Some of our published studies, though valuable, have been limited in scope; others, privately sponsored, remain unpublished.

A warm and appreciative welcome should, accordingly, greet *A Survey among Grassland Farmers.* This is the first major survey of its kind since the wartime Social Survey's report (*Agricultural Information and the Farmer,* May 1944).

The scope of the earlier inquiry was broader, in several ways; but in the view of one reader at any rate, in both reports the commentary is no less fascinating and instructive than the statistical data: perhaps more so.

The Grassland Survey was supervised by Mr. D. Sheppard, formerly of the N.I.R.D., who is well known for some valuable earlier studies of agricultural communications. His report, in its comprehensive form, seems to make exemplary use of its material. Seldom, surely, have the tabulated replies to a questionnaire been so carefully scrutinized, from so many viewpoints: it is a labour of real enthusiasm. The commentary is intelligent, scientifically honest and readable. The replies are interpreted with accuracy, and qualifications or reservations are conscientiously stated.

The result is a document of considerable value: its relevance is by no means limited to the sphere of grassland techniques. There is much here to interest advisers, administrators, educationists, and many farmers who nowadays, as members of various committees or in other ways, are actively rather than passively concerned with the communication of ideas.

The conclusions are based on a study of farmers' adoption of six up-to-date practices—controlled grazing, silage-making, the use of fertilizers on grass, the use of leys, tripod hay and milk recording. Farmers were asked whether they had adopted these techniques, and their reasons for doing so or failing to do so. Their answers give valuable indications of reactions to (for example) fertilizer use and silage. More important, the study attempts to identify the initial sources of advice or recommendation to use these techniques, and where farmers would go for further information or advice.

The report does not try to lay down rules for advisory workers; in a field embracing so many variables, this would be impossible. It is, however, the first major attempt at a sorely-needed "methodology" for the study of lines of communication to, and between, farmers.

Probably no one expects "market research" methods to supply complete evidence, unchallengeable in every detail, as to the sources of information and influence by which farmers may effectively be reached. Moreover, it is one thing for a farmer to hear or read about a technique, or see it on somebody else's farm; it is another thing for him to decide to try it; and yet another for him to adopt it as a regular practice. Those who recall the several silage campaigns of wartime and later years will no doubt appreciate these comments. But to many people professionally concerned in agricultural communications, including advisory workers, this Survey should be very stimulating and helpful. Many will earnestly hope for further studies, from which advisory work in various fields should derive enormous benefit.

G.C.

The Life of the Mole. GILLIAN GODFREY and PETER CROWCROFT. Museum Press. 15*s*.

There can be few animals more abundant on our agricultural land than the mole. Yet very few people have actually seen one alive and going about its business, and lamentably little is known about its life and habits. The mole is thought of vaguely as an agricultural pest (one can even buy an otherwise prohibited and dangerous poison for destroying it!) because of the mess it makes with its mole hills. Yet it must have been the originator of mole-drainage!

The truth is, we really do not know yet whether the mole is a blessing or a nuisance in our pastures. Now that it is no longer worth trapping to make into waistcoats and caps, we have to make up our minds on economic grounds how to treat it. This we cannot do without sound knowledge of its abundance, habits and effect upon the complex community of the soil in which it lives.

The present book makes a significant step towards accumulating and digesting this required knowledge. The authors have not only brought together for our convenience the literature about moles but have carried out important fundamental researches of their own, particularly into movements, food and population structure.

One outstanding fact here substantiated is that the mole eats a tremendous quantity of earthworms; over 90 per cent (and often 100 per cent) of all animals examined at all seasons and from all localities had these in their stomachs. It is suggested that a mole may eat, very approxi-

mately, about half a pound of food a day and, since there can be some 10 moles to the acre, a 20 acre field would have about 20 lb of worms removed each day. This may sound undesirable when one recalls the important function of earthworms in turning over and aerating the soil. But there are millions of earthworms in every field, and very many have got to die or the world would soon contain nothing else. Anyway the matter is too complex to make a snap judgment like this.

Perhaps the most striking addition to our knowledge of moles contributed by this book concerns their activity rhythms and movements. These were measured by catching moles alive, attaching to them a ring containing a chip of radio-active wire, releasing them and following their subsequent movements below the ground with a Geiger counter. The interesting discovery made was that the normal range of movement is quite small, the maximum diameter of the area searched being 30–100 yards. The whole of its area was traversed by each mole every day and intruders were unwelcome. This probably means that the density of moles cannot rise above a certain figure because of the increasing contacts that are made.

The Life of the Mole is a well-presented account of well-organized research. The style is straightforward, the tables and diagrams are clear and avoid unnecessary detail and the naturalist's devotion to discovery inspires its pages. One hopes that the increasing domestic cares mentioned in the introduction will not entirely suppress further researches on these lines.

H.N.S.

Farm Mechanization Directory (8th Edition). Temple Press. 37*s.* 6*d.*

The *Farm Mechanization Directory* has become an essential item in the tool-kit of an ever-increasing number of those engaged in the mechanization of agriculture. Since the first edition was published in 1951, successive issues have become steadily more comprehensive, reliable, and handy to use.

The Directory is divided into four main parts. Part I gives the names and addresses of practically all manufacturers of mechanical equipment used in farming, together with a useful list of trade names, brands and abbreviations. A list of the organizations concerned in various ways with farm mechanization is also included here.

Part II gives brief specifications of tractors, which are conveniently divided into four main categories. Part III covers test reports, and the new edition prints in full all the British Standard tractor test reports on tractors that are in current production. Also included in this part of the Directory are a useful alphabetical index to N.I.A.E. test reports on implements and machines, and the N.I.R.D. test reports on dairy machinery.

The most useful sections of the Directory to many of its regular users are Parts IV and V, which provide well classified and indexed information on most of the vast amount of equipment now available to farmers. The current edition has been brought up to date on new developments, and a praiseworthy effort has been made to eliminate reference to equipment that is no longer available.

Some well-chosen photographs help to make the Directory attractive.

C.C.

Estate Accounts. C. W. N. Miles. The Estates Gazette. Ld. 10*s.*

Estate accounting is a neglected subject, and it is not difficult to guess why; bookkeeping makes little appeal to the practical man after a hard day in the field. It is, however, more than ever necessary these days to support business-like management by an efficient system of accounting. In the past, emphasis has been on the stewardship aspect, on accounting for money received or spent by an agent. Too little attention has been given to the preparation of final accounts in a form likely to help an owner in deciding estate policy.

This, then, is a book about the preparation of final accounts—not about bookkeeping; indeed, it assumes the reader has some knowledge of accounting. It explains the advantage of a separate profit and loss account for each of the various estate activities, such as woodland management, and one chapter is devoted to examples of various "enterprise" accounts. The argument is introduced in chapter four that final accounts can usefully show whether the capital an estate represents is increasing or decreasing, and the reasons for any change. This information is surely vital to

the landowner today. Sales, purchases, improvements, repairs, mortgages and depreciation affect capital value and the arguments in favour of an annual balance sheet are clearly stated. We may expect more attention to be given in future to the presentation of accounts which show the owner what his assets are worth. This raises the problem of what basis of valuation to adopt in calculating the annual value of an estate for balance sheet purposes. Should an estate be valued on an open market basis when in fact there is no likelihood of its being sold? Is a fresh valuation necessary each year, or can it be at longer intervals? Mr. Miles discusses this in chapter four.

Lastly, because accounts are useless if not understood, Mr. Miles shows how a brief narrative report can bring them to life, and his example is admirably clear.

The author of *Estate Finance and Business Management* was the obvious man to write *Estate Accounts*. In his latest book, Mr. Miles has maintained the high quality of his earlier work.

R.G.A.L.

Welsh Rural Communities. D. JENKINS, E. JONES, T. JONES HUGHES and T. M. OWEN. University of Wales Press. 15*s*.

A study of a coastal village (Aberporth) in south Cardiganshire; the sociology of a market town (Tregaron) in central Cardiganshire; a social geography of a small region (Aberdaron) in the Llyn Peninsula, and the chapel and community in Glan-Llyn, Merioneth, make up the four parts of this book.

Each gives an interesting and scholarly account of its topic, together with a detailed list of notes and references. The individual authors are to be congratulated on condensing so much material into a relatively short space.

Their work is recommended to anyone wanting a concise and reliable picture of the evolution of country life in these four areas, which are typical of the rural regions in which they are situated. While they have much in common, there are major differences due to their situation and topography. For example, Aber-porth and Aberdaron are coastal areas, but Tregaron and Glan-Llyn are well inland. Consequently the developments and changes within the communities during the past 150 years have differed in both speed and nature.

The authors rightly point out that in spite of material and occupational changes, however, much of what might be described as "the way of life" and the social structure of these communities remains unchanged. Kinship still plays a tremendously important part in their life—a fact which any stranger to the area should remember, or he will tread on "hidden toes".

Those wishing to appreciate the real Welsh way of life would be well advised to read this book which, while recalling home life as it used to be in the countryside, gives an accurate picture of how Welsh farmers and farming have adapted themselves to modern developments. Extremely well produced by the University of Wales Press, it is enhanced by some excellent illustrations and a full and useful index.

W.E.

Historia Agriculturae. Vol. V, 1959. (A Yearbook issued by the Institute for Agricultural History, Groningen). J. WOLTERS, Groningen, Netherlands. fl. 21.50.

Now well established, this exceedingly useful periodical contains what is perhaps the most comprehensive bibliography of sources, books and periodical contributions to the history of agriculture all over the world that is currently published in any country. The work is necessarily co-operative, and the names of the international contributors are sufficiently well known to ensure that, though selective, it is a catalogue of all the worthwhile contributions made in any year. In addition the yearbook indicates sources, now so numerous, containing lists of contributions dealing with lesser areas and briefer periods. The current volume is a bibliography of books and articles on agricultural history published during the year 1955 in most European countries, America, Africa, Australia, Israel and Japan.

In addition to the annual bibliography which, in the nature of things, is bound to be a few years in arrears, the yearbook usually contains a document illustrative of Netherlands farming history. This issue includes the agricultural notes made by J. Kops, then chief of the Netherlands Agricultural Department, when he travelled through the country with J. Goldberg, Minister of Commerce and Industry, in

1800. Goldberg's idea was to collect information for a statistical survey of the Netherlands at that date; the plan was not entirely successful, but the survey is of marked significance. The document is introduced by Dr. L. S. Meihuizen, Director of the Institute.

Historia Agriculturae is a publication that should be on the shelves of the academic library of every university or other institution where agricultural history is studied.

G.E.F.

Strontium 90 in Milk and Agricultural Materials in the United Kingdom, 1958–59. (Agricultural Research Council Radiobiological Laboratory Report No. 2). H.M. Stationery Office. 5*s*. (5*s*. 7*d*. by post).

World-wide public concern at the increasing radionuclide content of foodstuffs, resulting from the contamination of pastures and herbages by the fall-out of radioactivity from nuclear weapon tests, has prompted a number of surveys of the extent of this contamination in different countries.

The current picture in the United Kingdom is given in the present report, the second to be issued by the Agricultural Research Council Radiobiological Laboratory dealing with the strontium 90 content of our diets. The first two parts are concerned with surveys of the level of strontium 90 in milk during the first six months of 1959, and in soil, herbage and animal bones in 1958. In the third part the results of some studies being undertaken at the laboratory to facilitate the interpretation of the surveys are briefly described. Appendices contain the individual results from the country-wide survey of the strontium 90 content of milk, and of herbages, mat and soil from particular sites.

As milk and milk products comprise the major source of strontium 90 in United Kingdom diets it is of particular interest to learn that, although the mean levels in milk in the twelve months ending June 1959 were 40 per cent higher than in the twelve months ending December 1958, there is reason to believe that the peak may have been reached. The results show that the level of strontium 90 in milk depends more on the amount of fall-out deposited on the herbage in the immediate past, than on the cumulative total in the soil. Thus, provided nuclear weapon testing is not resumed, the mean level for the current year may be lower.

The report is clearly presented, and the interpretation of the sombre picture it paints is scrupulously fair. Perhaps it would add to the interest of future reports if some mention were made of the findings of similar investigations in other countries.

Milk on the Arable Farm. (University of Cambridge School of Agriculture. Farm Economics Branch Report No. 51.) C. S. BARNARD and A. H. SCOTT. 4*s*.

Should dairy farmers aim for high yields, or are more modest yields obtained at low cost more profitable? This report examines the pros and cons of the two methods and reaches some conclusions of interest to dairy farmers in all parts of the country.

The results of a survey of 71 dairy herds in East Anglia were divided into three groups; bulk feed herds where less than 4 lb of concentrates per gallon were fed in winter and less than 2 lb. per gallon in summer; high yield herds where 1,000 gallons per cow was exceeded, and traditional herds with yields less than 1,000 gallons and rations of at least 4 lb of concentrates per gallon in winter and 2 lb per gallon in summer.

In brief either the bulk feed or the high yield system can be profitable: both showed very similar profit margins per cow and per acre, but the profit margin from the high yield system was shown to fluctuate more from year to year as the price of milk and the cost of concentrates varied. The high yield system is thus less stable and involves more of a gamble than the bulk feed system, reaping greater profits from favourable changes but losing more heavily from unfavourable ones. The bulk feed system is better suited to those who prefer the greater certainty of a fairly level profit from year to year.

There are, however, pitfalls involved in developing a herd along either system. The danger before the bulk feeder is that attention may become unduly focused on the feeding of bulk when its quality is not good enough for the job expected of it, with the result that yields are low. In a high yield system, yield per cow may become a fetish, so that no attempts are made to feed economically, and costs rise unduly high.

Nevertheless, both systems showed

much better financial results than those achieved by the dairy herds kept on conventional lines, where concentrates were fed as heavily as for the high yielders but with results little better than those obtained by the bulk feed herds. Grazing, which much more than any other factor can contribute to a low feeding cost, was utilized least of all by herds kept on conventional lines. Some of the farmers who follow the traditional system genuinely think their methods to be sound, because they have no records to prove otherwise. There are farmers under the impression that they get maintenance and the first gallon from fodders and the remainder from concentrates at 4 lb a gallon. In practice, however, they are doing something entirely different, but without records they fail to recognize the fact.

A dairy herd check sheet is provided with the report to give farmers some idea of their profit margins and to help them to analyse their feeding methods. The short time taken to complete this sheet would be well spent on many traditional dairy farms. Some farmers may not be pleased with their results but they will be better farmers for knowing them.

K.D.

Irrigation by Sprinkling. F.A.O. H.M. Stationery Office. 5*s*. (5*s*. 6*d*. by post).

The title suggests a more comprehensive coverage of the subject of irrigation than the actual contents justify, as they deal wholly with the engineering aspects of sprinkler irrigation. The book is designed "to aid in effecting the better use and control of irrigation water on the land", a very topical subject. This is partly achieved by a consideration of the advantages of sprinkler irrigation as compared with traditional surface methods not applicable to British farming; and partly by providing data and standards for the proper design of sprinkler systems. The remainder of the book describes the equipment used for sprinkler irrigation, and is enhanced by a comprehensive set of photographs illustrating the range of equipment at present available.

The section on design is sound in principle, and will provide for the serious student a most valuable guide to some of the engineering and hydraulogical aspects in system design. It is unfortunately of little direct practical value to the British farmer or for use in the design of systems in this country, as agricultural factors considerably affect the design and operation of any system. For example, crop rotation, area of crops suitable for irrigation at any one time and labour availability will all affect the requirements of the system, both in choice of equipment and in its operation. The standards quoted for water intake rates, the available moisture-holding capacity of soils and crop rooting depths may apply to American conditions, but will have little application to the U.K.

The appendices provide a most useful set of reference tables relating to friction loss in pipes, etc. The method of using these and the design principles are illustrated by a useful example. The units employed are unfortunately American gallons and dollars, and these call for additional calculations.

J.J.N.

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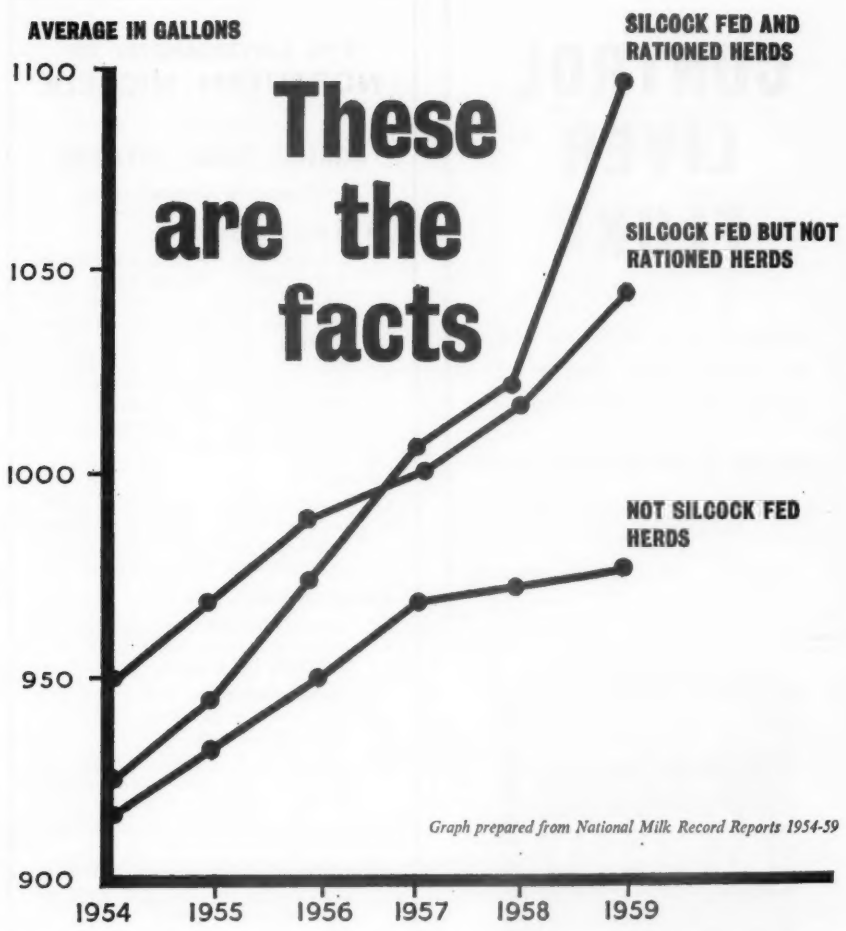

This is what happened among the herds that appeared in National Milk Record Reports throughout England and Wales over the last five years. Note the average yield of Silcock-fed-and-rationed herds which last year *rose* by 77 gallons while those from non-Silcock-fed herds remained much where they were . . . it will certainly pay you to ask your Silcock Agent about the

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